THE AKHIL BHARAT SARVA SEVA SANGH

A QUESTIONNAIRE FOR THE SURVEY OF VILLAGE INDUSTRIES

(Along with general information notes on those industries)

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PRINCIPAL, EXTENSION TRAINING CENTRE, GANDHIGRAM.

157

KAKAVADI
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PRINCIPAL,
GANDHIGRAM.
EXTENSION TRAINING CENTRE,

Preface to the 1st edition

Experience shows that many young men, who come forward to do economic surveys, enter on the work without any previous preparation. They fill in forms mechanically as the Census officers do. If their work is to be done intelligently, a certain amount of general information in regard to the industries studied should be first acquired. With this end in view, a few paragraphs on each industry have been added to this questionnaire. Students, who desire fuller information, are referred to the text books on the subjects. The surveyors should read these notes carefully and then set out on their survey work.

J. C. Kumarappa.

5 th July, 1947
Maganvadi,
Wardha, M. P.

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GENERAL INSTRUCTIONS.

1. Clearly demarcate the area of the survey either a village, a Group of ten villages, a Block or a tahsil or a District.
2. Give in detail a general picture of the area regarding the State, District, Natural settings, Type of soil, Monsoon, Climate, Rainfall etc.
3. (a) Collect detailed and accurate statistics from authorised sources regarding population–adults and children; males and females; old and invalids and literates and illiterates.
   (b) Area of the place–land under cultivation–land under forests–Porambok land–waste land etc.
4. How is cultivation carried on ? What are the main crops of the area ? Are these crops dry or wet cultivated. If wet cultivation, what is the source of irrigation ?
5. Always express quantity in weights. Do not ever try to mix up volumetric measurements.

   The following table can be conveniently followed for this survey :–

   40 tolas — 1 pound.
   80 pounds — 1 Maund.
   28 Maund — 1 Ton.

RICE

(*Take Sketches and Photos Wherever Possible*)

A—Cultivation

1. Varieties of rice with local names to be listed.
2. Classify the varieties as follows :—
   - i. Wet cultivated
   - ii. Dry cultivated
   - iii. By colour.
3. Yield of each variety per acre.
4. Give the market price of each variety.
5. Why are certain variseties preferred to others ? And by what classes or groups of consumers.

B—Preparation of rice from paddy.

6. (a) What are the implements used in preparing rice from paddy ? Give as much details as possible about them, such as kind of wood or stone, sketch, measurements, frequency of repairs, where available, price etc. Which type is preferred and why ?

   (b) Are there any rice mills ? How many ? What is their capacity and average out put ? Who owns them ? How much capital is invested in them ? What is the power used ? What is the fuel ?
7. What is the proportion of paddy that is hand processed and mill processed in your area ?
8. Efficiency of the implements, i.e., how much paddy is converted into unpolished or polished rice by a person in 8 hours by each type of implement.
9. Output:– Take a given amount of paddy of each variety by weight and after dehusking :—

(a) Measure the amount of whole unpolished rice in weight against each variety; and in the same way :

(b) Measure the polished rice,

(c) Measure the bran,

(d) Measure the broken rice,

(e) Measure the husk.

Note—Take separate figures for single polishing, double polishing etc. and for hand—polished and mill-polished; also for parboiled and raw rice. Does the process first give unpolished rice and then polished rice or only polished rice can be obtained ?

10. What percentage of the broken rice is utilised as human food ?

11. What is the cost of preparing unpolished rice in mills and in hand process ?

12. What is the cost of preparing polished rice in the two processes ?

13. What is the cost of equipment separately required for preparing unpolished and polished rice in (1) The hand process and (2) the mills.

14. Is parboiling process found anywhere ? How do people like parboiled rice ? Please give details of the parboiling processes.

C—Preserving.

15. (a) Describe the ways and means of preserving rice in homes. How does rice kept in this way compare in quality with that kept in merchants' godowns ?

(b) If rice is unpolished how long does it keep ? How and where is it kept ?

D—Cooking :

16. (a) Is rice washed in much water ?

    (b) Is it cooked in too much of water ? And if so what use is made of excess water drained off ?

    (c) If unpolished rice is eaten, is it cooked well ? Does it take more time and fuel to cook ? What is the effect of such rice on digestion ?

E—General :

17. (a) Is paddy dehusked at home or do people get it done by the mills ? Or by a special class of women ? If so, what do they earn daily ?

    (b) What is the proportion of home-prepared and mill prepared rice consumed in the locality ?

    (c) Are the people beginning to appreciate the better nutritive value of home prepared, unpolished rice and the evil effects of over polished rice ?

    (d) How is the husk utilised ?

F—Nutrition :

18. (a) Do you know of any propaganda carried on in your area in favour of hand-pounded rice ?

    (b) Do people know about this propaganda ?

    (c) Do they appreciate the value of hand-pounded rice ? If so, what is the reason ?

    (d) If they do not appreciate; why ?

G—Implements :

19. (a) What are the implements used in your area for dehusking and hand pounding. Give details of measurements with pictures.

(b) Are these implements hand operated ? Are there animal driven or water driven implements for this purpose. Have you seen their performance. If so give details of their mechanism, working and efficiency.

(c) Please compare the cost of production by the different implements and the mills.

FLOUR GRINDING

(A)

1. What proportion of people use hand ground as against mill ground flour ?
2. Wherefrom are the stones for the hand chakki obtained ? Are the stones *kachha* or *pakka* ?
3. Are mistries available locally for repairing the stones ?
4. Is any new device such as roller or ball-bearing etc. introduced in the chakki ? With what results ?
5. What is the price of a pair of stones ?
6. What is the output per hour ?
7. Are any bullock chakkies found working ? Give the out-put and the design, speed, cost etc.
8. Are there water-driven chakkis working ? If so, give the output, design, speed, cost, etc.

(B)

9. Are there any flour Mills ? How many ? What is their capacity and out put ? Who owns them ? How much capital is invested in them ? What is the power used ? What is the fuel ?

(VII)

BEE-KEEPING

1. How is honey obtained ? From jungles or from domesticated bees ? Is the modern method of bee–keeping introduced anywhere ? How many such colonies are there ? What is the average yield per colony per year ?
2. Do people find it adantageous to introduce this method ?
3. Is there any agency to distribute the boxes, extractor etc. and to instruct the people in the technique of this method ?
4. Is the honey produced consumed locally or sent to outside market ? If the latter is the case, is it done through middlemen ? Where is it sold ? And at what price ?
5. Do people realise the nutritive value of good Honey ? How many in your area are regular users of good honey ? Are children given honey ?

OIL

(A)

1. What varieties of oilseeds are available locally and what type of ghanis are used to crush them ?
2. Working efficiency of the local ghanis. Give exact figures for the following after personal verification :—
   (a) Are the ghanis driven by human power or animal power ?
   (b) Are there ghanis worked by water power ? Give details of ghanis with pictures.
   (c) Quantity of seed crushed per charge,
   (d) Time taken per charge,
   (e) Number of charges taken per day,
   (f) Oil extracted in a day. Percentage of oil
   Note :—State these figures separately for the different kinds of seed.
3. Do customers stock their own seeds and get them pressed on hire ? How many do ? What is the hire per charge ?
4. Are there co-operative societies or States interested in the development of this industry ? Give details.
5. How do the prices of oils and cakes obtained in this way compare with the market rates ?
6. Is the market oil adulterated ? If so with what ?
7. Is oil cake being used as human food ? What and how are the preparations made from it ?
8. How is the oil freed from sediment ? For how long does the oil keep well ? What steps are taken to preserve it ?
9. What oil products, such as soap, hair oil, paints etc. are used ? How many of these can be manufactured locally ?

10. What are the locally available raw materials used for preparing hair oils ?
11. What quantity of 'sajji matti' is available locally ?
12. Is vegetable oil used for lighting purposes ? If so which oil ? Give a description of the type of lamps used for this purpose.
13. What means have been adopted to ensure hygienic conditions in regard to the place of production ?
14. In the last ten years what is the decrease in the number of ghanis ? Give reasons for the decrease.

(B)

15. Are there any oil mills ? How many ? What is their capacity and output ? Who owns them ? How much capital is invested in them ? What is the power used ? What is the fuel ?

C. Agriculture.

16. (a) Give details of the acreage under oilseeds and the average animal output. How are the oilseeds marketed ?
(b) What percentage of production goes out of the area ?
(c) Is any oilseed imported ? If so, what variety and quantity ?
(d) Are there coconut trees in the area ? How many ? What is their approximate yield per year ?
(e) Is coconut oil used locally ? For what purpose ?
(f) How is coconut oil obtained ? Is it all imported or locally pressed ?
(g) What quantity of coconut is locally pressed ?
(h) Do you have non-edible oilseeds in the area ? What are their names ? Can you give an idea about their approximate production per year ?
(i) What percentage of these seeds are collected ? Are these pressed locally ? How are these oils made use of ? What are the uses of these oil cakes ?

PALM GUR MAKING

1. State and District.
2. Number of date palms (सिंदी).
3. Number of palmyras (ताड़).
4. Number of tappers (persons knowing how to draw juice from the palm).
5. Daily or monthly earning of the tapper.
6. Daily wages (rate) of unskilled labourer.
7. Retail & wholesale rate of sugarcane jaggery per lb. and maund of 80 lbs.
8. Rate per cart load of light fuel.
9. Number of villages where more than 200 date palms or 100 palmyra palms are found in clusters (not scattered)
10. Are the trees utilised for gur making or for toddy ? How many for each ? And during what season of the year ?
11. Are people in that area used to drink fresh palm juice (Nira) ? In what season is Nira drawn and sold ? Approximately how much of Nira is collected and sold in one season ?
12. What is the average yield of gur per tree ? Total gur produced from all palm trees.
13. Where is the market for gur ?
14. What are the articles produced from leaves etc. of the trees ?
15. Is any sugar being made by hand machine from palm or cane juice ?
16. Do people use cane gur locally ?

17. Is there much consumption of sugar ? Where does such sugar come from ?
18. Is sugar—cane cultivated in your area ? What is the acreage under sugar—cane ?
19. What is done with the sugar cane ? Is it converted into Jaggery or sold out for the mills ?
20. Where are the sugar mills situated ? What is the price paid for sugar–cane and what is the approximate trans– portation charges to the mill.
21. Work out the cost of sugar cane gur at the rate at which cane is sold to the mills and after including for the bullock and human labour spent, fuel and other articles used.

TANNING

1. How many 'chamar' families are engaged in tanning ? Do women help in any part of the process ?
2. How many carcasses on an average do they have to tan during a year ? What do they pay or return to the owners of the cattle ?
3. Are the carcasses carried over some vehicle or are they drawn over the ground ?
4. Where are the pits for tanning leather situated in the village ?
5. What tanning materials are used ? Where are they obtained from ? At what cost ? Have they been analysed ?
6. Is chrome tanning being done ? If not, are any of them willing to learn that method ?
7. What process of tanning is followed; salt process or chuna process ? Why ?
8. What are the water facilities ? How is the water; hard or soft ? Has it been analysed ?
9. Do they get any financial help from Government or the Co-operative society or the money lenders ? On what terms ? Is there any dues, duty or tax on this industry ?
10. To what extent and by whom are the hides disposed of ? Work out the net income from the disposal of one carcass if (i) only the skin is utilised and (ii) all the parts are utilised.
11. What varieties of tanned leather are imported ? Why ? To what extent ?

12. What articles are manufactured locally ?

13. What is being done with the different parts of the body such as skin, flesh, fat, bones, horns etc ? Is eating of carrion prevalent ?

14. Are bones and flesh being utilised for manurial purposes ? How is the manure prepared from both ? If no manure is prepared what happens to the bones ?

15. Are horns utilised for any industry such as button making, comb making etc. ?

16. Are the chamars unemployed ? To what exent ? Any subsidiary occupation ?

17. Work out the income and expenditure of a typica 'chamar' family.

SOAP MANUFACTURE

1. Where are the deposits of 'sajji matti' found ?
2. What is the extent of the 'matti' available ?
3. What is the percentage of soda in the 'matti' ?
4. How far is the 'matti' utilized ?
5. What are the oils available locally ?
6. Is any soap made locally ? What is the process ?
7. How is the water, is it soft or hard ?
8. What is the cost of soap and how does it compare with a good quality soap in cost and quality ?
9. Is ready market found ?

FIBRE INDUSTRY

1. What articles of fibre–ropes, mats, rugs and carpets, etc.– are used in the locality ?
2. Where do they come from ? At what cost ?
3. What are the fibrous plants grown in the area ? To what extent ? What is the scope for further extension ?
4. What fibres are utilised ? For what purposes ?
5. Any fibre being exported ? How much ?
6. Describe the processes of taking out the fibres from the stem.
7. What are the tools used for decorticating, spinning or weaving purposes ?

PAPER MAKING

1. Is there any handmade paper making centre ?
2. Is it run by professional kagzis or is it opened newly ?
3. What raw materials are used ?
4. Give a description of the implements used.
5. What is the monthly production ?
6. Is any stationery being prepared ?
7. Where are the products sold ?
8. What toys, if any, are made from the paper pulp ?

POTTERY

1. How many potters are working in the village ?
2. What articles do they prepare ? Utensils, bricks, tiles, pipes, toys, cups etc.
3. What are the special articles of the place ?
4. What kind is the clay ? Is it mixed with any thing ? In what proportion ? Where from are the mixtures obtained ? At what cost ?
5. Has the soil ever been analysed ? What is the report ?
6. Is the potter's wheel the same old, traditional one or has it been improved in any way ?
7. Which processes are carried on by men and which by women ?
8. Is there any glazed pottery work being done in the vicinity ? Have the local potters taken any advantage of it ? Who supplies the furnace for glazing ?
9. Do they find employment in this industry all the year round ? If not what is unemployed period ? Are any of them prepared to learn new methods ? Do they follow any subsidiary industry ?
10. Where are their products sold ? Is there any dues, duty or tax to be paid ?

NOTES ON VARIOUS INDUSTRIES

The Rice Pounding Industry

If as a matter of fact in practice we find that hand made products are dearer than factory made ones the reason is not so much the greater efficiency of the factories, but their power to employ capital and to control raw materials and markets with the help of capital. This is particularly true in India where decentralised village industries are not given fair opportunities as against the well provided for and organised centralised factories. Such being the case it is not possible to conclude that if factory goods are cheap it is because of the greater efficiency of large scale production.

Consumption of home pounded rice

There is, no doubt, a great scope for the improvement of instruments used in village industries. With such improved instruments it will be easily possible for home pounding of rice to come back to its own. In fact, in spite of the inroads that rice mills are making in villages and in spite of inefficiency of the instruments of home pounding the bulk of the rice consumed in India is even now home pounded as shown in the table below.

Province	Percentage of the rice eating population using hand pounded rice (1938)
1. Bihar	90
2. Assam	85
3. Uttar Pradesh	85
4. Orissa	80
5. Bengal	75

6.	Hyderabad	70
7.	Travancore	45
8.	Madras	30
9.	Burma	20

It will be seen from this table that all the rice-eating tracts except Madras have more or less adhered to the indigenous method of preparing rice, namely hand-pounding. It is only in Madras that machine-milling of rice has made the greatest headway, practically destroying the custom of hand-pounding. There, the mills have penetrated even into small villages. Apart from thus milling its own rice, Madras also imports large quantities of rice from Burma. And this has necessarily to be machine milled or polished, for when rice is unpolished it does not keep for long as it is attacked by insects which seem to know better than we do what is good for them as food and what is not. So while they attack unpolished rice, they leave polished rice alone. It was precisely because of this that traders who were interested in shipping large quantities of rice abroad introduced rice mills for polishing the rice, for it was necessary that the rice so sent out should keep for an indefinite period of time. But mill polished rice, as we have already seen, is deprived of Vitamin B₁ which is a preventive of beri-beri, with the result that we find a higher incidence of beri-beri in the Madras Presidency, especially in those parts such as Andhra where only raw (not parboiled) milled rice is consumed, than elsewhere in India.

Cost of hand-pounding vs. machine-milling

To compare the cost of preparing rice through machine-milling with that through hand-pounding we give below a table showing the cost of preparation of 2½ maunds of rice through

these two methods. We have taken the figures for the same area, the mill being located in the Bardoli Tahsil and the hand-pounding done in the adjoining Bulsar Tahsil both of the Surat District in Gujarat. It must be noted that the hand-pounding of rice is done on a commercial scale in Gujarat by a special community called 'Gola' which has acquired great skill in the art and does it very efficiently. That is why inspite of the high wages of 6 annas a day paid to women doing this work the cost is comparatively low.

	Cost fo Producing 2½ Mds. of rice	
	Unpolished	Polished
In mill	Rs. 0—6—0	Rs. 0—8—0
By hand pounding	Ps. 0—6—0	Rs. 0-15—9 (Once polished)
		1—5—0 (Twice polished)

The cost of preparing unpolished rice is the same whether in a mill or by hand-pounding. In confirmation of this we are told that at Bareja near Ahmedabad, when mills could not cope with the work of dehusking, they employed human labour for the purpose without suffering any loss. This fact is of special significance. It means that if unpolished rice or merely dehusked rice alone is consumed, mills will not find it profitable to work. Further as the labour involved in husking, i. e. producing unpolished rice, is light as compared with that required for polishing, women will husk at home with the help of the flat grooved chakkis so that there will be little or no incentive for them to go to the mills for this purpose.

A study of the distribution of cost as between husking and polishing in the case of the mill and in hand pounding is

instructive. If the mill only dehusks paddy the cost is 6 annas for 2½ maunds. If it also polishes rice along with dehusking paddy, the additional cost for polishing is only 2 annas as all that is required is to work a further part of the plant, the other expenses such as maintaining the staff, the initial power consumption etc. remaining constant. This means that polishing in the mill adds only 25% to the cost of dehusking. In the hand-pounding of rice, on the other hand, the two processes of dehusking and polishing are quite independent of each other and whether they are done at a time or separately, each costs fully as a separate process. In other words, while the ratio of cost of dehusking and polishing in a mill is 3: 1 it is reversed in the hand process if rice is subjected to two polishings. Hence hand-polished rice becomes expensive as compared with mill-polished rice. The figures given show that the second polishing alone costs 5 annas more for 2½ mds. of rice. This indicates the chances of reduction of cost in hand-pounding if the degree of polishing is reduced, while in the case of the mill the cost will be affected very little by reducing the degree of polishing. Both as regards the capital required for equipment and the recurring expenditure the additional costs for the mill are very little for polishing. the major portion being required if paddy is only to be dehusked. Mills therefore are interested in popularising highly polished rice, for that gives them an advantage over the hand process.

It is clear then that the advance of the mill is only in polishing. This is borne out by the general information received from another place also. In Tumsar, M. P., we are informed that about seven years ago people husked their paddy at home

and brought the whole rice for getting it polished in mills. When the mills began to charge a flat rate for polishing whole rice as for preparing polished rice from paddy, the custom of husking paddy at home was given up.

The mill owner in question charges a flat rate of 10 annas for preparing 2 mds. of rice adding 2 annas as his profit to the actual cost of 8 annas shown in the table above. Thus there is a difference of 6 to 11 annas per 2½ mds. as between milled rice and hand-pounded rice. which comes to 2½ to 4½ annas per maund.

This lower cost of machine-milled rice cannot however be regarded as pure saving. Loss in nutritive-value of milled rice has already been discussed. There is also some loss occasioned by broken husk getting mixed with the bran. Besides extra expenditure is involved in cart hire for taking paddy to the mill and rice back home. People do not care to take the husk back as it involves further cartage and so it is lost to them for use as manure or fuel in the village. All told, therefore, the apparent expensiveness of hand-pounding is amply compensated for.

Moreover, the cheaper rates charged by rice mills for preparing rice are not always due to lower cost of production but also to the element of competition on which they work, as will be seen from the profit and loss account of one of the small rice mills working in Tanjore District, Madras Presidency.

Cost of plant, equipment, running charges, interest, depreciation etc.

Per day	Rs.	0-13-8
Daily working charge	Rs.	3-3-2
Total (Expenditure)		4-0-10

Daily income at one anna per kalam on 35 kalams of paddy		2–3–0
Daily income from flour mills		0-4-0
	total (Receipts)	2–7–0
	Loss per day	1-9-10

If the old rate of 2 annas per kalam of paddy is charged for husking as it was before competition, the income per day for husking 35 kalams would be Rs. 5–7–6

the gain per day would be 1–6–8

Difficulties in the way of hand–pounding :

If the mill scores over the hand-pounder then, it is only in the production of highly polished rice which as we have already pointed out is deprived of nutritive value. If nevertheless milled rice is steadily making headway against hand-pounded rice, it is not only due to ignorance on the part of consumers in regard to the superior nutritive value of hand-pounded rice but also due to:- 1. the straightened finances of villagers, 2. the low physical vitality of women, and 3. the low purchasing power of the people.

The first difficulty is well described by Dr. Pattabhi Sitaramayya in the "Rice problem in India" in the following words "Home pounded rice means 'home storage of paddy. Most of the small land-holders own not more than 2 or 3 acres and they are in debt. What little paddy they grow is sold out in a lump perhaps at the very field itself in order to meet the liabilities of debt or some expenditure incurred by social ceremonies or the purchase of cattle, construction of house, and so on. In the months of January and February (harvest time) capital expenditure awaits the land-holder which has to be made immediately and can only be met by the sale of paddy. For the time being the householder is able to meet the capital expenditure by selling his paddy and live on credit till the beginning of the

next year, when again the sale of paddy will enable him to meet his existing and future liabilities. In effect then the villager has no paddy to pound." The Problem today then for hand-pounding as well as for most village industries is one of retaining the necessary raw materials in their place of production for being converted into consumable goods by local artisans. But the financial condition of the people leaves them helpless to prevent the drainage of their raw materials.

The second factor equally responsible for gradually putting an end to the practice of hand-pounding of rice is that our women are exhausted by mal-nutrition, ill-health and continuous child-bearing, and instinctively avoid undertaking extra work demanding physical effort. They regard the advent of rice mills as a blessing. This is also the result of men leaving the whole of the task of preparing rice to women. If the present process is followed in some part of the country of pounding paddy in a mortar with the help of a pestle for both the husking and the polishing operations is divided into grinding on a chakki for husking, and beating in a dhenki for polishlng, it will enable men, who now regard working at the mortar and the pestle as a woman's job, to do the harder part of the process namely beating in a dhenki, leaving the lighter operation of grinding to woman. This division in the process will also make it possible for us to obtain whole unpolished rice on the one hand and pure bran on the other, which is not possible when both the husking and the polishing are done with the pestle and mortar. The strain involved in winnowing can be reduced by using the winnowing fan.

There is also a third reason for the spreading of machine milling of rice. As stated above the labour necessary to pound

a maund of rice is $2\frac{1}{2}$ to $4\frac{1}{2}$ annas more than that demanded by the mill for machine-milling the same quantity. The monthly requirement of an adult man consuming rice as his staple food may be estimated at half a maund (40 lbs.). The consumption of hand-pounded rice in the place of machine milled rice will increase the monthly expenditure of rice by about 2 annas. Thus for an average family containing four consumption units the extra cost will be about 8 annas. Where rice is not the only staple food but is taken along with other cereals the extra cost of hand-pounding over machine-milled rice may come to about 4 annas per month for a family. This is nothing when compared with the return that accrues from the superior food value of home pounded rice. Further, as unpolished rice is richer in ingredients less of it will be consumed than polished rice, so that, actually, though hand-pounded rice may be a little more expensive than mill polished rice, it may be a saving to use hand-pounded rice as less of it will be consumed. But poor people whose purchasing power is low do not have the patience to appreciate all this and they purchase the apparently cheaper article of the two. This but points to necessity of educating the people in this regard and inducing them to prepare rice themselves and save whatever amount is spent in getting it done in mills.

LOSS OF MINERALS BY POLISHING RICE

Raw Rice

	Hand Pounded	Machine Polished	Loss Percent
Phosphorus content	0.28	0.13	54
Calcium content	0.043	0.013	70
Iron content	2.2	1.0	55

LOSS THROUGH WASHING AND COOKING

If rice is washed 3 times and cooked with liberal amount of water, as is usually done, 75°/。 of the iron, 50°/。 of the phosphorous and 50°/。 of vitamin B_1 originally present may be lost.

PARBOILED RICE vs. RAW RICE.

	Parboiled and Polished	Raw and Polished
Phosphorous	.15	.11
Calcium	.01	.01
Iron	2.20	1.00
Vitamin B_1	60	20

The remedy therefore for these evils lies in our own hands. It is simply this : Stop polishing rice. If we do we shall not only be able to solve the problem of rice-shortage which is threatening us, but also help to but new life and health in the starved bodies of our rice-eating population.

DO WE NEED RANGOON RICE ?

Quantitatively, if the enormity of loss involved in polishing rice, whether in the mills or by hand pounding, is realised all efforts would be directed towards stopping this unnecessary waste, especially so now when there is a general shortage of food, particularly of rice, with the stoppage of rice from Burma. Along with the "Grow more food campaign" it will be well to insist on this aspect of the question. It is not enough to grow more. It is essential that whatever is grown is fully utilised and every form of waste avoided.

India's average yearly production of clean rice is about 30 million tons. About 1½ million tons are imported from Burma. If we do not take account of the small percentage of export, the import of Burma rice comes to only 5 percent of the total Indian rice. We are disturbed at the loss of this 5 percent because it is sudden and apparent, but we have chosen to be indifferent to over 10 percent loss caused by polishing our rice. That means the loss in polishing rice is easily twice as much as the import from Burma. What is more, the unpolished whole rice, being more nutritive is cosumed less than the less nutritive polished rice. Thus the saving effected in both these ways will amount to at least 15 percent *i. e.* 4½ million tons. If we can save this wastage and let us hope the urgency of the situation will enable us to save it, there is no cause to be perturbed by the loss of Burma rice.

It is gratifying to note that the Government has advised the people to eat only hand pounded rice and thus eliminate the waste of foodstuffs. We would only urge that the ambiguous term 'hand pounded' which implies varying degrees of polishing should be replaced by the clear term 'whole unpolished' rice which alone can ensure the stoppage of waste.

2
MAIDA AT WHAT COST

(a) Loss in Nutritive value

Maida is a fine flour prepared out of the starchy endosperm of the wheat grain leaving out the outer layers and the gsrms. It is thus devoid of vitamin B_1, the minerals and suitable proteins. As it is mostly starch sweet preparations

made out of it provide only carbohydrate and fat, that is fuel to the body.

Maida being devoid of vitamin B_1, its constant use weakens the digestive and other organs of the body. Those organs which do the greatest service to the rest of the body require vitamin B_1 for their proper functioning. Such organs are made up of muscles and nerves and it is the function of vitamin B_1, to make these two strong, throughout the body. In this sense, the efficient working of all the systems of the body depends on the proper supply of vitamin B_1. The effect of vitamin B_1 deficiency becomes universal in the body. Thus, if muscles of the digestive system become weak, it causes indigestion and constipation. Similarly, owing to deficiency of this vitamin the muscles of the lungs and the heart become weak and impair proper circulation of blood, and finally the nerves and the brain give unsatisfactory work. From the point of view of body machinery the one vitamin which is most important is vitamin B_1.

Being also devoid of bran, maida, completes the weakening of the mechanical process of digestion and leads to constipation. The absence of minerals and proteins in the maida retards the production of the digestive juices and thus disturbs the chemical process of digestion also. As Maida preparations are softer than those made out of atta they are not chewed much and are hence attended with all the maladies of non-mastigation.

Maida preparations may be considered desirable from the point of view of taste and the art of cooking but nutritively they are injurious to health and are wasteful.

Maida, when used as the staple article of diet, places its users on the same level of the rice eaters of the South and East of India. They are faced with the same problem; they start to build up their dietaries with a staple of relatively low nutritive value. If their health and physical fitness are not to suffer, they must spend more money on supplementary articles of diet in order to make good the deficiencies of white flour than if they had begun to build on the surer foundation of atta.

(b) Quantitative Loss

The quantitative loss involved in maida production is well illustrated by a recent press note issued by the Government of Bombay which we reproduce here in toto. The glamour for maida is greater in cities than in villages and it is the city folk, with sedantary and other unnatural habits of life, that should take particular care not to indulge in maida preparations.

The press note reads:

NO SWITCH OVER TO WHITE BREAD

Suggestions have been recently made, in a section of the press that now that the war is over Bombay should revert to white bread. These tend to overlook the circumstances in which Government, on the advice of the Food Advisory Council and its Standing Committee, had to prescribe wholemeal bread for the city and to exaggerate the effect of the cessation of hostilities on the food position of the province, says a Press Note.

The decision to issue only wholemeal wheat flour and bread was taken early in 1943 with a view to stretching out the limited wheat supplies available to the province. There has been no appreciable change for the better in the supply position since then. Actually supplies of wheat available for distribution within the Province today are not sufficient to maintain an adequate quantum of wheat ration in all areas. There is no indication that the end of the war will bring about any improvement in the supply position of wheat. The indications are indeed to the contrary.

Reversion to white bread in Bombay City and the Bombay Suburban district alone would require an extra 7,800 tons of wheat per annum. Additional supplies to this extent are unavailable : they can be obtained at the expense of the already inadequate wheat ration in the rest of the Province. The number of persons who eat bakers' bread is only a small fraction of the number who consume 'Chapatis' made of wheat. Taking Bombay City and the Bombay Suburban District, the proportion of wheat consumed in the form of bakers' bread and in the form of Chapatis is 1 : 7. There seems little justification for discriminating in favour of bread eaters at the expense of the rest of the population.

3
MALTS.

A suggestion for improving the quality of our food, though not very effective yet good in its way, is to malt

the grains. The process involved is simple. The grains are soaked in water for 12 to 24 hours, the water is strained and the wet seeds are allowed to germinate or sprout for a day or two under a wet cloth. After a little drying the sprouted grains are ready for use in the raw or cooked form or after being powdered.

During the process of germination striking changes take place in the food substances of the grains. The starch is converted into dextrines and maltose and the proteins into peptones and amino acids, substances which are readily digested and, therefore, fit for infant and invalid consumption. The sprouts contain vitamin C to the extent of 15 mgs. per 100 gms. according to Dr. Akroyd, and also some vitamin A, according to Sir Robert Mc Carrison, both of which are not present in the grains in their ordinary form.

Nutrition experts have spoken of malts mostly in connection with cereals. This is purely from the point of view of invalid food. In india, cereals are not much utilised for being malted and this can be done with profit. This will solve the difficulty of those who depend on foreign malted foods, the imports of which amounted to about Rs. 77,00,000 per annum, till the present war, according to the Agricultural Chemist to the Government of Madras. Practically all the common cereals such as wheat, barley, maize, juar, bajra, rice (in the form of paddy) and ragi can be malted and substituted for the imported malted foods.

But in as much as the protein contents, and not only the starch of the grains are converted into their easily digestible forms during the process of germination, pulses which are rich in proteins can also be utilised as malted

food. In fact, pulses such as gram, mug, moth etc. are being malted in India for centuries past. Cereals like bajra are also occasionally used for the malted grains are called वरडां in Gnjarat, उसळ or बिरडचा in Maharashtra, अंकुरित छोला आदि in Bihar and Bengal, फूले हुए छोले in Hindi provinces and 'Mola alu' in Andhra.

So, the process is nothing new to our people and no elaborate instructions are required for its teaching. What requires to be done is to get the practice which is restricted to certain occasions or to certain communities like the Jains who use it more often than others, extended for all communities and for every day use. In the Punjab and in Sind, pulses are only soaked in water and used. They can be persuaded to allow the process to take its full course.

As Sir Robert Mc Carrison puts it, sprouting of grains is a very good way to obtain Vitamin C when green vegetables and fruits are scarce. As this vitamin is most sensitive to heat, however, he suggests that the sprouted grains should be eaten raw or after cooking for a very short time.

Malted foods are given chiefly to invalids and infants as they are easily digested. Most of them such as Ovaltine. Horlicks, Mellin's Food, Force and Malt Extracts are imported. But today with difficulties of transport their prices are soaring, and soon they may not be procurable at all, with the result that those who have been dependent on them have begun to feel desperate and are buying them up in

as large quantities as possible for whatever price they can be had.

It is amazing that we should be so helpless as to imagine that such foods cannot be made by ourselves. It is one of the effects of large scale production that its victim the consumer, is left in a paralysed condition incapable of doing any thing for himself. He gets so used to buying articles ready-made that he is without initiative and enterprise. Malting is no miracle. It is a simple process, which we can try with any of the cereals grown in our country. All that is required is patient perseverance with experiments till the best results are obtained.

In the South, a few persons have produced malts quite successfully from ragi (Mundal or Okra). The formula is as follows :—

Take six measures of ragi of fine quality and soak it in pure cold water for sixteen hours, the water being removed and replaced by fresh water every four hours. Then drain away the water and dry the ragi in shade. This is usually done in a dark room by spreading the ragi over a mat and covering it with a clean piece of white cloth. The darkness enables quick and successful germination. When the radicles grow to about half an inch in length it is dried in the hot sun for full forty-eight hours. The most important and skilful process in manufacture of malts is the frying, which should be carried on a low fire till the ragi assumes a golden colour. After frying it is ground carefully, sieved and the fine flour packed. A teaspoonful

or two of the malt may be taken in a cupful of hot water or milk, with sugar as desired.

The physical characteristics of the malt so prepared compare favourably with good grade imported malts, chiefly in regard to colour, consistency and smell. It forms a resonably good suspension even on shaking with cold water. The cold water extract is roughly of the same order as is to be expected for good malts. It forms a more uniform suspension when hot water is employed. On analysis it was found that there was free starch present in this malt but content of this was not unduly high.

Successful experiments have been conducted by the Department of Agriculture Madras, in preparing malt from cholam (Hindi-juar). The process is in broad outline as described above and consists of the same four operations—(1) Soaking, (2) Spreading, (3) frying and (4) grinding. In the case of cholam, the soaking takes from 30 to 40 hours, and the spreading 4 or 5 days for reaching the proper stage of germination, and the frying is done at 60 to 70% C over a slow charcoal fire, immediately after which the grain is thrown on a piece of gunny for removing the radicles. The grain is then ground on a coffee grinder or stone mill.

Malts are easily digested because during germination of the grain chemical changes take place which result in the production of easily digestible sugars and other elements which assist the digestion of other foods that might be mixed with it. It is to be hoped that enterprising young men and women will take to the preparation of malts out

of indigenous cereals and popularise their use among the people, instead of their being, as now, a luxury food possible only for the well-to-do.

4

GRAIN STORAGE IN INDIA

Not enough attention has been focussed on the extent of damage caused to food grains by want of proper storing facilities and by the loss incurred during processing · the corn. Food supply is going to be a vital problem in the post war period. All efforts will have to be made through planned agriculture to increase the total output of food grains. The "Grow more food" campaign initiated by the Government of India is a step in that direction. But it would seem that the Government is concentrating only on this propaganda and have not touched the method of stopping the waste caused in storing and processing of corn. Increasing the out-put of food grains involves long term policies and the immediate results may not be very far reaching. In spite of all the persuasion, coercion and facilities, their drive to grow more food has resulted in the total annual increase in the production of food grains in India of roughly about 5.5 million tons or 9°/. on the normal total output of about 60 million tons. As against this, the damage of food grains caused during storage is calculated on a conservative estimate to be 3.3 million tons. Or about 5°/. on the total production. In preparing Maida from wheat and polished rice from paddy, roughly about 5°/. of the total production of corn is wasted, not to speak of the waste caused in the cooking process of rice,

Thus the loss in storage and preparation of food grains is more than what is achieved by way of increasing the output.

These facts are enough to emphasise the supreme necessity of finding out ways and means of stopping this enormous waste. It should be remembered that along with this quantitative waste also the quality of the grains gets very much deteriorated, often producing diseases. We shall confine ourselves here to the problem of storing food grains. Taking wheat as an example, out of about 10 million tons of annual production about 5 million tons reach the markets to be stored and distributed. The remaining 5 million tons being conserved in their place of production. So far as local storage of individual houses is concerned people are using various forms of vessels such as earthen ware 'Kothis' or bamboo 'Dholas' and resort to various preserving agents such as castor oil, neem leaves, mercury, etc. All these methods are good for private users and the damage estimated on this form of storage is not much. The problem only arises in regard to the storage of grains in market places. Somehow or other, the merchants holding large stocks of grains have not become alive to the dangerous loss caused during this storage, probably as they cover their own loss by realising higher prices. But all the same the damage harms society as a whole. It should be the concern of the public health departments and local governments to stop this waste and deal with it in the same way as with food adulteration.

The grains have to be protected from dampness and weevils and vermins. These latter can creep into the crevices in the floors and walls of the buildings and thus survive from season to season. It is not possible to clean completely such places nor can they be protected from moisture. From both these points of view godowns having 'pucca' floors and walls and having a few outlets which can be controlled, are essential. If the enormity of the loss incurred in storage at present is realised it should not be difficult to persuade municipalities or even private merchants to construct such godowns. People are building houses to be rented out. There is no reason why 'pucca' godowns for grains storage should not be built even as a matter of investment. Such godowns have been built at Muzaffarnagar in the U. P. where the higher prices fetched by the better preserved wheat grains are regarded as enough return on the investment.

A 'pucca' godown, having a capacity of about 265 tons, will cost at present, between 6 to 10 thousand rupees. If the 5 million tons of wheat that enters the trade on the whole in India is to be properly stored 'pucca' godowns costing between 11 to 15 crores of rupees are required. The annual loss on the 3 thousand tons of wheat, which is the estimated damage due to storage at the rate of Rs. 6/– a maund, comes to about 5 crores. Thus within three or four years the investment is recovered by the saving effected in the preservation of wheat. The same thing applies to rice also.

PRINCIPAL
GANDHIGRAM.
EXTENSION TRAINING CENTRE

5

Bee Keeping

Honey as a Food and Medicine

As Medicine

Honey has been found to be highly beneficial to those suffering from heart disease. It is somewhat of a laxative and its continued use keeps the system free from accumulating poison. Ii is a disease preventive. It has been found that many of the disease germs that afflict human bodies die in honey in a very short time.

For ages it has been a common remedy for coughs and colds. It is good for children. Anaemic and weak children, placed on a diet of milk with honey, show amazing results.

Dr. G. N. W. Thomas, an eminent doctor in Great Britain writes (1924) "In severe cases of mal-nutrition with heart weakness. I have found honey to have marked effect in reviving heart action and keeping the patient alive and I had further evidence of this in a recent case of pneumonia".

Dr. Arnold Lorand of Zechoslovakia, author of several medical books, in his book "Old Age Deferred" recommends honey for those having a weak heart.

As Food

Honey is easily digested and assimilated; it is the best sweet food, as it does not cause flatulence and even prevent it to a certain extent promoting the activity of the

bowels. On account of its quick absorption it is invaluable for athletes. It aids digestion. It contains, besides levulose and dextrose, mineral elements such as iron, lime, sodium, sulphur, magnesia and phospheric acid so necessary to our body and as such is definitely superior to the ready made glucose available in the market.

Oranges, lemons and fruits are quite acid to the taste. Honey is also slightly acidic in taste, but as food it is potentially alkaline. If we want to maintain the acid alkaline balance in our diet a prominent place ought to be given to honey.

Man's Intervention in the Production of Honey

However useful honey may be as medicine and as an article of diet, is it in any way dependent on man to increase its production ? Has he not to rest content on the supply that the bees of their own accord give ? This was the belief commonly held till it was the privilege of the talented philosophers and literary men of the West to break this belief. So many men there had spent their lives in patient observation of the working of the bees and in introducing little things by way of getting control over their working that man today is not the helpless witness in this field of nature. Today he has formed friendship with the bees and they both react to mutual gain. Man's intervention has helped the bees to produce more honey with less effort and in a systematic way with the result that the production of honey in the West has considerably increased since the days of the first experiments. Domesticated bees of today stand in relation to man as the domesticated cow.

Scientific bee-keeping in our country is a recent history and the credit goes to Rev. Newton, a missionary in South India where this industry is now carried on on an extensive and commercial scale. It has now been taken up by practically all the provinces and some centres like the Khadi Pratisthan, Sodepur in Bengal, and Honavar in Karnatak have developed this industry from the point of view of both production and investigation to such an extent that India can look forward with confidence to make this industry a common thing for every farmer or gardener.

Man's Contribution :

1. Hive

After careful examination, inspection and study of natural combs man ascertained that bees store honey in the upper one-third of the comb and use the lower two-thirds for rearing their brood. He followed the same principle and invented the modern hive. The modern bee-keeper never robs the bees of their honey in the lower chamber, which is really the brood chamber, but extracts honey only from the upper chamber which is the bank of the bees. This also helps extraction of honey without injuring the eggs, grub, larva etc. which get otherwise squeezed along with the honey. Thus there are two advantages of the hive (1) we get pure honey (2) the race of the bees is left undamaged to multiply itself. Besides these the hive protects the bees from their enemies, and from extremely of climates.

2. The Honey Extractor

Even if the upper chamber alone is used for honey extraction, the destruction of the combs in itself is a great loss from the point of view of honey production. It is said that to make one pound of wax bees have to eat 8 to 10 lbs. of honey. This shows the importance of the preservation of the combs. The introduction of the honey extractor has helped this preservation. It extracts honey by centrifugal force and leaves the combs in tact to be placed again in the chamber.

Artificial Comb: Artificial Food

Man has gone further. He supplies artificial combs which help the bees to save the labour and the honey even for the first time.

In the rainy season, when the rains wash the pollen from the flowers, many of the bees die of starvation. At such times sugar syrup is fed with advantage.

Bee Pasturage

There is a general impression that bees ought to be kept only in flower gardens. This is not so. There may be miles and miles of such beautiful gardens with glowing shining flowers blooming every where and yet a whole district may prove a poor honey district. As a rule, there is more nectar in wild flowers than in cultivated ones and the more the bees are in forest regions or hilly tracts, the more will be the honey they produce. That is why we hear that in hilly tracts and forest areas bees thrive more than on plains.

Below is a list of useful pasturage for bees.

Flower plants	**Creepers**	**Hedge plants**	**Vegetable plants**
Rose	Antigonon	Justicia	Plantain
Zinnias	Jaequemontie	Adhata Vasak	Beans
Mari gold	Bignonia	Leucacea Glane	Cucumber
Pallianthus	Varesta	Queen of night	Brinjals
Poppies	Honey Suckle	Duranta	Peas
Daisy			Raddish
			Lady's fingers
			Drumstick
			Cholam

Field crops	Fruit trees	Other useful trees
Jowar	Apple	Soap nut
Bajri	Citrus varieties,	Neem
Maize	Guava	laurel
Buckwheat	Jambul	Ponghai
Sweet Corn	Chikoo	Tamarind
Oilseeds	Mango	Shisham
Onions	Woodapple	Tun
Chillies	Phalsa	Arjun
Pulses		Karanja
		Babul

Bees in aid of Agriculture

In some flowers the two cells (male and female) are adjacent to each other and an easy union is possible, but in others these cells are apart and some other agent is necessary to bring about the union. Nature has devised three agents for this purpose, wind, water and insects. The

union of the two cells of the same flowers is called self-pollination while that of the cells of differeut flowers is called cross-pollination. Cross—pollination yields better and more seeds than self–pollination. The bees are regarded as the priests among flowers bringing about cross--pollination. They thus aid agriculture. It is in the interest of the agriculturist, therefore, to keep bees.

Why Bees Abscond

It is a sad experience with many beginners that bees abscond from the hive. They abscond for the following reasons.

1. If they are much disturbed in the process of capturing and transport.
2. If the combs are spoiled, mishandled or exposed so that the eggs and the brood get injured.
3. If the bees do not like the colour and the odour of the wood of their hive.
4. If they suffer from the wax moth caterpillars.
5. If there is scarcity of pollen and nectar in the locality.
6. If the queen gets hurt and dies.
7. If there is not sufficient ventilation and accommodation in the hive.
8. If there is no brood left in the hive.
9. If they are not protected from heat or cold.

10. Carelessness, negligence or too frequent inspection of colonies especially in the case of newly captured colonies are some of the causes.

How to test pure honey

Two tests can be given, water test and methylated spirit test, for detecting adulterated honey. Pour one or two drops of honey in a glass of water. If it darts like an arrow and reaches the botton before it begins to melt it is pure honey; but if it begins to melt on the surface of the water, it is adulterated.

Pour a little honey in a cup of methylated spirit. if the honey does not get mixed with it, it is pure, but if it gets mixed and produces milky liquid, it is adulterated.

6

Oil Pressing

1. The Position of the Ghani to-day

Large scale oilmills in India, being the concern of vested interests, who can employ not only capital but also conduct much propaganda, have received more attention from the public than they deserve, so much so that there is in the minds of people an unreasoning faith in the greater efficiency of these in as much as they are a form of large scale machinery. Taking this greater efficiency for granted their advocates, on the one hand, support them for the purpose of raising our standard of life, and their opponents, on the other hand, hesitate to discuss the question from the purely economic point of view. This one sided propaganda has also created a general impression that the oilmills have practically ousted the ghanis from the field and it is now difficult to revive them. This, however, is far from the truth. The mills are there and their number has increased. But

they are engaged more in pressing oil for the nation's growing needs for industrial purposes than for edible uses. In this sense, the mills have supplemented the ghanis rather than replaced them. Secondly, the mills have introduced an element of competition and thereby made the life of the ghani precarious.

Notwithstanding this, the ghani to-day enjoys an honourable position and still supplies the bulk of the oils used for edible purposes. Unfortunately, no information is available in connection with the proportion of oil pressed by ghanis and mills, except in regard to linseed and groundnut oils which are meant for industrial purposes. This is typical of the interest the Government has shown towards small industries. Of the two oils for which information is available, 11% of the total production of oilseeds in India is pressed in ghanis and 17% in mills as will be clear from the following table:

1935—36

Seeds	Production (in tons)	Quantity retained after exports (in tons)	Quantity crushed (in tons)	
			In ghanis	In Mills
Linseed	488,000	255,000	67,000	133,000
Groundnut	2822,000	1710,000	480,000	720,000
			547,000	853,000
Percentage of total oilseed production			11	17

Linseed and groundnut, together with castor, form about two thirds of the production of oil seeds in India. But after export and other domestic uses the puantity

crushed comes to only 28°/. of the total production, 17°/. being crushed in the mills and 11°/. in ghanis. Of the other oilseed, the export is negligible and the quantity crushed comes to about the same as in the first group i. e. 28°/. of the total production. For this group it is difficult to tell the proportion between ghani pressed and mill pressed oil for want of information, but if we take as a guide the oil production in U. P. and Madras for which we have information, the proportion is as 2: 1 or roughly 17% and 11% of the total production of oilseeds in the country, Combining both the groups, the total quantity of seeds pressed is 56%, divided half and half between the ghanis and the mills.

2. A claim betrayed

A special claim advanced by the Indian oilmills in their support is that if more mills are started they will press oilseeds here and export extra oil instead of oilseed being exported and thereby save a valuable item of oilcake for the nation. The inefficient ghani, they say, will not be able to do this. A perusal of the statistics relating to the export of oilseeds from India does indicate a progressive reduction in their export but that has not helped to retain the oilcake in the country. On the other hand, the mills have betrayed the very purpose for which they claimed support and have, until forced by the exigencies of the war, been exporting the bulk of the oilcake they produced, thus playing the role of the opportunist.

3. Efficiency compared

We are accustomed to associate efficiency with big machinery and large scale production. If the test of efficiency be taken as greater production of national wealth and increased purchasing power of the masses, and not the capacity of one class of people to earn more at the cost of another class of people, it will be a surprising revelation for most of us to learn that the large scale oilmills do not possess greater efficiency than the improved ghanis. Many oilmills, which are engaged in only crushing the seeds and not in side industries such as the manufacture of soaps or paints and varnishes, are not paying, and so they often change owners. There seems to be a craze for starting oilmills among a section of the monied people, who run them on unbusiness-like lines, make losses and then sell them away. In Berar and Khandesh, for example, there are more oilmills than the supply of seeds warrant, aad therefore they are underworked. These mills are run because of the capacity of the proprietors for suffering losses, and not because of their efficiency.

What the mills save by way of greater percentage of oil-extraction and less crushing cost goes in the distribution cost of oil and cake. Thus the mills have no advantage over the ghanis. But their large scale production enables them to keep the smallest possible margin between the cost and the selling prices and thus to enter into unfair competition with the ghanis. The same thing can be done if a proprietor employs a large number of ghanis and produces on a mass scale. But this we should guard against, because it results in concentration of wealth and the simultaneous low purchasing power of the masses.

Thus centralised production, which turns independent artisans into wage earners and transfers their profit to middlemen, and reduces many to poverty at whose expense only a few make profit, does not add to national wealth, and therefore should not be allowed to continue, no matter whether it is done with the help of big machinery or of simple tools.

That the mills by themselves do not possess greater efficiency than the improved ghanis is borne out by the following table showing the comparative crushing cost per ton of oil in the ghani and the mill :

	Ground-nut Rs. as. ps.	Gingelly Rs. as. ps.	Linseed Rs. as. ps.	Castor Rs. as. ps.
In a Bombay Mill	21-14-6	24- 2-9	35-10-9	32- 2-0
In Maganvadi Ghani	47- 0-0	47- 0-0	83- 7-9	47- 0-0
Difference in crushing cost	25- 1-6	22-13-3	47-13-0	14-14-0
Difference on account of lower percentage of extraction in Ghani	15- 0-0	15- 0-0	22- 8-0	15- 0-0
Total Difference	40 -1-6	37-13-3	70- 5-0	29-14-0
Difference per lb.	0- 0-3½	0- 0-3	0- 0-6	0- 0-2½
Commission ,,	0- 0-2	0- 0-4	?	?

It must be noted that in computing the crushing cost in the case of the mill, interest charges on the sinking capital of about 4 lakhs of rupees and depreciation on machinery are not taken into account as is done in the case of the ghani.

In the case of the ghani the crushing cost includes the wages of tne oilman at the rate of 8 annas a day, which means that he can afford to sell the oil at the same rate as the retail mill rate and the cake at the wholesale mill rate. If he sells the ghani cake directly to customers he will get in addition an amount equal to the commission charged by the retailer.

Again, the position of all the oilmills situated in different parts of the country is not the same. Mills at ports enjoy many advantages over those in the interior. The freight policy of railways helps such mills to get oilseeds at cheap rates and throughout the year. They are, therefore, worked to their full capacity for the whole year, and hence their crushing cost is less than that of the mills in the interior. As the mills export most of their oilcake, those in the interior get less price for their cake equal to the freight charges upto the nearest port. All this means that the mills in the interior have to sell their oil at higher rates than mills in the ports. The table given above relates to a mill in a port.

As the mill in question converts linseed and castor oils into varnish and medicinal oil respectively the exact commission charges for raw oils are not available. But

elsewhere they certainly cover the difference between the crushing costs of oil in the ghani and the mill. It is important to remember in this connection that these commission charges, which are less in the place of the mill, become very much more when oil reaches distant villages. Thus, so far as the consumer goes the crushing cost of oil in an oilmill, including the indispensable distributing charges, is the same as that in the improved ghanis. In other words, customers get no advantage from the so called greater efficiency of large scale oilmills.

Let us see if the oilmills serve any other useful purpose.

Taking the case of mustard oil, for example, we shall consider the working of an oilmill with power driven ghanis and expellers as having a crushing capacity of 200 maunds of seed per day of 24 hours and producing 1750 maunds of oil per month of 25 working days. The table below gives the different items of cost of working such a mill and those of working the number of Maganwadi ghanis required for an equal output, bearing in mind that while the mill works for 24 hours the ghani works only for 8 hours a day. The cost of one ghani together with the bullock is taken to be Rs. 125/-. Though in a normal unit one man works two ghanis, the followiug has been calculated on the basis of one man and a boy for two ghanis in order to facilitate work and sale.

	Capital for equipment	Crushing cost analysed					
		No. of workers	Wages	Power	Repairs, Depreciation	Interest	Total
	Rs.		Rs.	Rs.	Rs.	Rs.	Rs.
In mill	30,000	19	500	800	250	350	1900
In Maganvadi ghani	26,500	140	2100	2120	265	235	4720

For the extraction of 1750 maunds of oil the mill requires 5000 maunds of seeds. As the ghani extracts about 2 per cent less oil, to produce the same quantity of oil it requires 130 maunds more of seeds costing Rs. 780/- at the rate of Rs. 6/- per maund. The commission charged to the mill for distribution of oil at the rate of 12½ per cent comes to Rs. 3500/- at Rs. 2/- per maund of oil which sells at about Rs. 16/- per maund. On this basis the total price of 1750 maunds of oil works out as follows :

	Cost including crushing charges Rs.	extra seeds Rs.	Commission Rs.	Total cost Rs.
In mill	31,900		3500	35,400
In Maganvadi ghani	34,720	780		35,500

In adition to this the mill has to bear the freight on seeds, oil and cake and this extra cost will easily be much more than the apparent nominal margin between the prices of mill oil and ghani oil in the above table. As the oil-man sells his oil himself there will be no commission to pay and as he crushes local seeds there will be no freight to bear. Thus, looked at from the consumer's point of view the mills are not able to supply oil cheaper than the ghanis. The mill requires more capital for equipment than the ghani, it gives employment to less than one seventh the number of persons. It distributes less than one fourth of wealth by way of wages, it employs the wrong power in so far as it does not employ the cattle and the carpenters

available in villages and in their place uses machinery imported from abroad, and after all is not able to supply cheap oil to customers.

Large scale production in a centralised form is by itself an evil, in that it provides the basis of exploitation which is the root cause of violence in the world. It becomes still more an evil if it cannot even put forward the plea of efficient service to society like the large scale oilmills.

To solve the problems of overproduction and uneven distribution of wealth arising out of the use of power driven machinery two alternatives have been suggested, both based on the belief that these problems are not the outcomes of the use of machinery as such but of factors outside it, and that if these factors are altered, full benefits of the use of machinery can be realised. On is to socialise production and distribution. The other is to substitute in the place of large scale centralised factories small power driven units worked in cottages all over the country side. This is not the place to enter into the merits or otherwise of these suggetions. Here we shall concern ourselves with a practical instance and show that, at least in regard to industries concerned with a simple process such as oil pressing, power-driven machinery, whether large or small, does not establish its superiority over the village implement. And if the machine is not superior purely from the economic point of view, nobody wants it for its own sake.

To estimate the efficiency of the ghani as compared with that of the oilmill, we may compare the production

costs in each case. The costs, which vary with the size of the unit, are as under :

Size of the pressing unit		*Crushing cost per maund of oil* Rs.	as.	ps.
1. Oilmills having a capacity of production of maunds of oil per day	800 to 1000	1	0	0
2. ,,	500 to 800	1	2	0
3. ,,	100 to 500	1	4	0
4. ,,	40 to 100	1	8	0
5. ,,	10 to 40	1	12	0
6. ,,	5 to 10	2	0	0
7. From a unit of two improved type of bullock ghanis having a capacity of 8 seers per charge and requirng 1½ hours for extraction, the output in a day of 8 hours from 2 maunds of mustard seed will be 26 seers of oil. The working charges per day will be Rs. 1-6-0. Thus per maund of oil produced the cost will be		2	2	0

The sbove table reveals some interesting facts. It clearly shows that it is not the power-driven machinery, but it is the largeness of business that accounts for cheapness in production. This is a fundamental factor which should be clearly realised, if the controversy regarding machinery vs. handicrafts is to be properly understood.

Again, it is not the production cost at the factory godown that is of real consequence to consumers. They are concerned with retail prices which include distribution charges in addition to production cost. Now since the crushing cost varies inversely with the size of the pressing unit, the largest producing unit will be the one which achieves the lowest cost of production. But, as we have seen above, the larger the production at any one place the greater will be the distribution cost entailed, so that the lower the crushing cost, the more the distribution cost and vice versa. Consequently the lower production cost is made up by the higher distribution cost and the consumer gains nothing thereby. If the mill produces a maund of oil for Re. 1, it spends a large amount on packing freight, insurance, advertisement, commission to salesmen, damage in transit and such like, all of which expenditure is saved by the village oilman who sells his oil on the spot.

In the last power driven unit No. 6 in the table, the distribution cost will be the minimum, but the production cost is practically the same as in the bullock driven ghanis, no. 7 in the table. Thus in this case neither the power driven machinery nor the largeness of its business are helpfull. On the contrary, the smallest unit of machinery such as it would employ, will require a population of 5,000 to 10,000 as compared with 700 in the case of the ghani unit, if we take 2½ tolas as the daily per capita consumption of oil and 25 as the working days in a month in both the cases. That is to say, even the smallest power driven

unit will not suit most of our villages which have populations of less than 5000.

Further, large scale machinery may be profitable where several complicated processes are involved in production, but in oil-pressing this is not so. The machinery of the oilmill can no doubt operate with greater speed and exert more pressure on the seed than the ghani and thereby secure the advantage of a lower crushing cost and a greater percentage of oil extracted. But as the process involved is simple and only one, the advantage scored by the mill over the ghani in the above two respects is not such as to be more than made up by its greater distribution cost.

All this shows that the much advertised efficiency of the oilmills is only a piece of propaganda for which there is no justification. It also proves the need for studying each industry separately, examining the nature of the processes and the implements and their effect on society as a whole, before we come to any conclusions in regard to its worth in the life of the nation. If that is done, the idea of collecting oilseeds from distant places to operate a very simple process of pressing them and then distributing the separated products, *viz*, oil and cake, to the same places again, would seem absurd. From the standpoint of planned economy oilmills appear to be mountains made to labour to produce rats.

4. GHANI OIL-CAKE VS MILL OIL-CAKE

Further proof of how only one side of the picture is presented before the public can be found in the propaganda made by some in favour of mill oilcake as against ghani

oilcake, both from the point of view of nutritive value as well as cheapness. Their argument against the common belief in the higher food value of the ghani cake is not only that the quantity of oil contained in the ghani cake is not necessary for the animals but that it is also not assimilated and therefore causes digestive trouble. They further contend that in as much as the extra quantity of oil contained in the ghani cake is not assimilated it constitutes a national waste.

We invited expert opinion on the subject in regard to the following points:

1. Is the higher content of oil in the cake of the ghani not assimilated at all and is, therefore, only wasted, or is it assimilated but is costly considered from the point of view of 'food units'?

2. Is there an upper limit beyond which the animal cannot assimilate oil in the cake? If so, what is this limit? Does excessive oil in the cake have an injurious effect on the animal?

3. If the oil in the cake is assimilated, does it play any part in increasing the fat content of milk produced by milch-animals?

We reproduce here, in extenso, the replies which we have received from the Officer in charge, Animal Nutrition Section, Veterinary Research Institute, Izzatnagar, U. P. and from the Agricultural Chemist to the Imperial Agricultural Research Institute, New Delhi.

The former writes:

1. Between the range 8% to 13% (8% to 11% from power driven mills and 11% to 13% from country ghanis) the

animals should assimilate the oil if the cake is not fed excessively, *i. e.* not over 3 lbs. to non-producing animals of 1000 lbs. live weight, or, not over 5 lbs. to producing animals of 1000 lbs. live weight. If more than this quantity is fed to animals, the oil may not only escape complete assimilation, but may also cause digestive trouble. However, within the range already mentioned, the sample having more oil (*i. e.* 13%) will naturally supply more nutrition than the other having 8% only."

2. " Excessive amount of oil in ration of dairy animals tends to lower milk yield; this is specially the case with certain oils. It has been found, however, that no untoward effect is shown on feeding on a ration which supplied a pound of oil per day per 1000 lbs. live weight. We have already pointed out that excessive oil in feed may produce injurious effect on the animal by upsetting the digestive capacity."

3. " Some oils like cotton seed oil, palm kernel oil etc. increase the fat content of the milk, but the effect is not permanent. Moreover, when the milk fat is increased due to extra ingestion of certain type of food fat (or oil), the normal quality of milk fat is markedly altered and assumes more or less the chemical and physical nature of the particular type of food fat (or oil) fed."

In the opinion of the Imperial Agricultural Chemist.

1. " The higher content of oil in the ghani cake is assimilated as food and not wasted. The food unit value of ghani cake is higher than that of press cake. The relative cost of cake from ghani and oilmill would ultimately determine the usefulness of one or the other. "

2. " There is no upper limit of oil in the cake for assimilation. Even the ground oilseeds are fed and

assimilated by the cattle. But this should not be interpreted to mean that any amount of oil in the feed would be assimilated. The digestible co-efficient of oil in the oilseeds is approximately 95%, provided it is given in proper proportion in the ration. In regard to the upper limit to the oil content in the cakes, that will, as would be expected, vary with the breed of the animal and its age, but an oil content upto 15% in the cake may be considered not wasteful."

3. "The oil in the cake is utilized by the animal as food and is not reflected in the percentage composition of the milk."

4. "The quality of the milk fat is affected by the fat of the oil cakes, but not the quantity of fat. This is governed by the secretive power of the mammary glands which are not affected by the general well being of the cattle."

These two eminent authorities thus definitely confirm the common belief that the food unit value of ghani cake is higher than that of the mill cake. In view of this fact, if the ghani cake sells at a little higher rate than the mill cake, it is only justified.

And after all, the range of oil content between the ghani cake and the mill cake is not so wide as is made out. The oil content in the ghani cake is rarely beyond the limit of 15% as prescribed by the Imperial Agricultural Chemist and is usually below that limit in case of most ghanis prevalent in the country.

(5) Oil contents of cakes pressed in different units

The oil contents of cakes obtained from various pressing units analysed in the laboratory of the Harcourt Butler Technological Institute, Cawnpore, are as under :—

Pressing Unit	Linseed cake	Mustard cake	Til cake
1. Ordinary teli kolhu driven by bullocks	14-15°/。	15-16°/。	14-15°/。
2. Improved Wardha Kolhu driven by bullocks	12-58°/。∵	11.2%	12-54% ∵
3. Bengal type power driven ghani	11°/。	10.5-11%	11-12°/。
4. Bombay type power driven ghani	11°/。	10.5°/。	11°/。
5. Expellers	7-7.5°/。	8°/。	9°/。
6. Anglo-American or cage type hydraulic presses	8-9°/。	8°/。	8°/。

(6) Handicaps of the ghani industry

The handicaps from which the ghani is suffering at present are :

(a) Lack of capital for stocking oilseeds
(b) Difficulty in disposal of oilcake
(c) Inefficiency of the present ghanis
(d) Lack of side industries
(e) Loss of oilmen's prestige for genuine oil

(a) Lack of Capital for Stocking Oilseeds

To-day in India, all roads to wealth and prosperity seem to lead to cities. The villages, which are the producers of wealth are drained of it. It is usual to find that materials produced in villages are not only sold cheaper in cities than in their place of production but often enough they cannot be had in the villages after the season. This is also the case with oilseeds. Being short of capital, the farmers are obliged to sell away their seeds as soon as they produce them. Only very few of them can afford to wait for better prices before disposing of them. And still

(∴ Analysed by the Cotton Oil mill, Navasari, Gujerat)

fewer people can stock seeds sufficient even for their use; nor are the seeds held by the village merchants to be sold again to the villagers of the oilmen, as the village merchants generally act merely as middlemen for large scale oilmills situated in a central place, where seeds flow from all directions like water towards a low level. It is due to this that ghanis ply in big cities and towns and other market places where the oilman can obtain seeds throughout the year, though at higher rates, while the village ghanis are lying idle as no seeds are avilable there during the off-season. In fact villages are the logical and convenient places for ghanis to work, as now mill oil is being sold there dearer and in a worse form than in cities, as commission, adulteration and dirt are added at every stage.

In the meantime the ill-fated country ghani is given a bad name and hanged. It is not supplied with the seeds and is condemned as inefficient. The ordinary farmers and the oilmen cannot stock seeds for lack of capital, and the ghanis do not get enough work. They cannot keep on plying just for a while for a few rich people in the village who can afford to stock their seeds. Even they are few and far between, as owing to the difficulty of getting ghani oil they have given up the habit of using it.

The problem is therefore, one of conserving the seeds in their place of production. The simplest and the most effective way of doing this is to induce the consumers to store their own seeds and get them pressed on hire. This system is indigenous to our land and if properly developed

can solve the many problems connected with the industry such as capital for the oilmen for stocking seeds, marketing of oil and cake, adulteration and rancidity. In the case of flour, people store or buy corn and get it ground on hire. They should do like wise for oil also.

The village merchants can also be persuaded to stock seeds if they are assured of ghanis being able to ply on. If necessary, stocking of seeds may be organised on a cooperative basis.

It is but proper that the artisan is left to do the technical side of the industry and is not overburdened with the financing of it. In the absence of such a sound arrangement, the resourceless oilman is left to struggle agaiust the resourcefull mill-owner. This is so not merely in regard to the stocking of oilseeds, but also in the marketing of oil. Living on day-to-day earnings, the poor oilman can ill afford to make sales on credit, which is the demand of most people in the village, while the bania, acting as the agent of a mill, is able to sell on credit and thus attract customers.

(b) Disposal of oilcake

The giving up of the practice of consumers storing their own seeds has created another problem for the ghanis. When people stored their own seeds they fed the oilcake to their cattle. Now when they buy oil very few of them are inclined to purchase, in addition, oilcake for their cattle. So, for lack of customers for oilcake oilmen find it difficult to work their ghanis with profit. The mills get over this

difficulty by exporting the major portion of their produce of cake. Thus the giving up of the practice of storing oilseeds by consumers has helped to hand over the industry of oil-pressing from the ghanis to the mills and deprived our cattle of a valuable source of food.

While some of the oilcakes are popular and therefore readily sold, others find no market. There is also no proper relationship maintained between the food values of oilcakes and their market values. This raises further complications for the ghani. We give below statistical data to enable people to make a proper selection as between different cakes as cattle feeds and manures.

FOOD VALUES OF DIFFERENT OILCAKES PRESSED IN MILLS

Name of cake	*Moisture*	*Fat*	*Protein*	*So-Carbo Hydrates*	*Fibre*	*Ash*	** Food Unit*	*Co-efficient of price Index*
1. Ground-nut cake	7.95	9.60	48.06	23.49	4.15	5.35	168	100
2. Til Cake	5.10	10.75	41.31	24.44	4.70	13.70	156	92.85
3. Rape & Mustard	3.15	10.20	34.61	36.04	8.35	7.15	148	88.10
4. Decorticated cotton cake	5.20	9.50	34.94	34.51	9.55	8.30	146	86.90
5. Safflower	7.25	9.20	39.62	20.43	14.35	9.15	143	85.10
6. Linseed	7.00	9.10	33.25	35.70	7.50	7.45	142	84.50
7. Niger	9.35	7.95	34.06	24.94	13.85	9.85	130	77.40
8. Coconut	4.55	14.85	22.93	34.27	16.80	6.60	129	76.80

* "Some cattle feeds of Western India"-by D. L. Sahasrabuddhe

The proper money value of foodstuffs depends upon the value of the different constituents and their proportion in the foodstuffs. Digestible fat and digestible proteins are considered to be equal in value, while each of those is taken to have 2.5 times the value of digestible carbohydrates. When these values are added together the sum represents what should be the comparative money value of the food stuff itself. In short formula.

(Fat x 2.5) + (Protein x 2.5) + Carbohydrates = Food units.

Oil-cake as human food

Some of the oil-cakes, such as the groundnut cake, the tilseed cake and probably the linseed cake, can suitably be used as human food. Other cakes contain a very high per cent of fibre that is coarse which cannot be used for human consumption.

Oilcakes deserve a permanent place in our national dietary from the point of view of improving its quality. Our diet is said to be deficient in protein, which must be made good in every possible way. Oilcakes are very rich sources of proteins, that of groundnut containing as much as 48.6°/ₒ, that of tilseed 41.31°/ₒ, and that of linseed 35.70°/ₒ. They also contain enough of fat and thus form a valuable item of food.

The quality of the proteins of the oilcake is also fairly good. According to Sir Robert Mc Carrison the proteins of pulses are better than those of the cereals and the proteins of the nuts (of which oilcakes are the residue after oil is extracted out of them) are better still. Dr. D. L.

Sahasrabuddhe gives the following analysis of the proteins of the groundnut cake along with those of milk, the soyabeans and the gram.

Aminoacids	Groundnut Cake	Milk	Soyabeans	Gram
Arginine	13.26	4.84	5.12	11.85
Histidine	1.58	2.59	1.39	1.42
Lysine	4.69	5.95	2.71	7.42
Cystine	1.42	1.20	?	2.02
Tyrosine	4.80	4.50	1.86	2.95
Tryptophane	0.66	1.50	?	0.46

He observes, "Groundnut protein is characterised by its higher content of Tyrosine and Arginine,—two of the most important essential aminoacids. Milk proteins are considered to be perfect and complete and it will seem that groundnut cake is nearer to milk than soyabean is".

Our people do occasionally eat groundnut and tilseed, but being very rich in fat they are hard to digest and therefore, cannot be taken in any large quantity. The cake is comparatively easy to digest and can very well form an item of our regular diet. Looking to the high protein and fat value of the oilcakes, they are available at much cheaper rates than pulses and hence even poor people can afford to eat them.

Such a practice will not be altogether new either. It is wide spread in Andhra, where til seeds are crushed after the outer layer, which is blackish in colour, is removed. The dirt is removed by soaking til seeds with water in cloth or in a basket. The oilcake, which is whitish

(Telagapindi as it is called in Telugu), is used for preparing curries. We came across a village near Amraoti in which there is a custom of the oilman regularly supplying the seed cake to the village people, who eat it by cooking it along with some vegetable.

If the oilcake is to be used for human consumption, the problem is that of cleaning the seeds completely from dust and sand. Groundnut seeds being of bigger size, are easily cleaned. But smaller seeds like til or linseed are difficult to separate completely from sand of the same size. They should, therefore, be washed in plenty of water in which the dust will be washed away and the sand will settle at the bottom. The best way of being sure of the cleanliness as also the freshness of the oilcake, is to get one's own seeds crushed in a ghani under supervision after cleaning them properly.

The preparations can be varied to suit the tastes of the consumers. Good biscuits or sweetmeats can be made out of the cakes or they can be cooked along with vegetables or dhals. The cakes keep well for a pretty long time if they are kept, after drying on fire, in closed tins or bottles.

Oilcake as Manure

Oilcake are also very valuable as manure. They are concentrated in form and are more readily available than farmyard and other bulky organic manures. They are generally valued for the amount of nitrogen they contain.

*Manurial Composition of some of the oilcakes.

No.	*Name of Oilcake.*	*Nitrogen Content Per cent*
1.	Groundnut cake	7.69
2.	Til cake	6.60
3.	Safflower cake	6.34
4.	Cotton seed cake (undecorticated)	5.59
5.	Rape and Mustard cake	5.54
6.	Niger seed cake	5.45
7.	Linseed cake	5.30
8.	Neem cake	5.04
9.	Castor seed cake	4.50
10.	Coconut cake	3.67
11.	Cotton seed cake (decorticated)	3.38
12.	Mahua cake	2.72

7
PALM GUR

Lakhs of date, palmyra, and sago palms grow naturally in many places in uncultivable lands and are at present practically going to waste. In many parts, where the palms exist, skilled labour for tapping them is available in abundance. If only gur making is taught, the industry can be widespread, as it has been for centuries in Bengal and Madras.

Utilising palm trees for gur making is of advantage in three ways: (1) It relieves most valuable land from cane cultivation. (2) It is a counter part of prohibition.

*Analysed by Dr. D. L. Sahasrabudhe.

Under prohibition of intoxicants, the palms cannot be used for toddy drawing and the erstwhile tapper will be rendered jobless. Gur making can employ all of them. It will also introduce the social reform among the toddy addicts by teaching them a beneficial method of utilising the palms. (3) Palm Gur contain more mineral elements and is more nutritious than cane gur.

How much land is relieved

The annual Indian consumption of gur and sugar comes to about 43 and 11 lakhs of tons respectively, on an average. This employs about 40 lakhs of acres of land under sugar cane cultivation. The maximum yield of gur from an acre of sugar cane is about 60 mds. (the average being very low). As compared with this about 500 palm trees yielding about 1500 mds. of gur annually, can be planted in an acre of land. At this rate, if the total needs of gur and sugar in India are to be produced from the palms' 14 crores of trees are required. Of these about 4 crores are already existing. About 2 lakhs of acres of land is required for the remaining 10 crores. It is well to remember here that good agricultural land is not required for the purpose. Any waste, low lying or marshy land will do. Plenty of such land is available in every province. Bombay alone having 8 lakhs of acres. Thus all the 40 lakhs of acres of land that is employed under sugar cane cultivation at present, can be completely relieved and put to best use. It can produce about 25 lakhs of tons of wheat or 20 lakhs of tons of rice or juwar.

Which-gur is easy to produce ?

It is necessary to consider this question from another point of view also. Sugar cane cultivation requires the best fertile land, enough of water and manure and demands much labour and capital. Cane gur can be produced where all these facilities are forthcoming. That is why its production is restricted to certain localities. Cane also requires crushers, either wooden or iron ones, bullock driven or power driven and all this means money. As such it is outside the reach of poor farmers.

Palm gur involves none of such problems. Any land suits it; it requires no watering or manuring; it requires no cultivation or crushing, the juice oozes itself from the tree and is simply to be collected in pots. Thus there is practically no capital required. Every family can have its own requirements of trees grown in the kitchen garden as it has its own cow. Thus palm gur can be compared to tube wells which can be bored anywhere, whle cane gur can be compared to rivers that are found only at certain places.

Nira vs, toddy

The psychological association of palm gur or tad gur as it is called, with toddy, creates a kind of prejudicial impression upon people. But there is as much difference between nira, the fresh sweet juice of the palm from which gur is produced, and the toddy which is fermented juice and from which no gur can be produced, as there is between fresh milk and fermented curds.

Nutritive value of palm gur

The following tables give an idea of the nutritive value of the palm gur as compared with that of cane gur or sugar.

No.	Item	Moisture	Protein	Fat	Carbo-hydrates	Cane sugar	Glucose
1.	Cane sugar	0.04	....	....	....	99.7	Nil
2.	Cane gur	8.86	0.25	0.05	89.84	....	....
3.	Palmyra gur	8.32	1.04	0.19	87.29	76.86	1.66
4.	Date palm gur	9.16	1.46	0.26	86.07	72.01	1.48
5.	Sago palm gur	9.16	2.28	0.11	9	84.31	0.53
6.	Coconut gur	10.32	0.96	0.15	53	71.89	3.70

Chief mineral elements per 100 grms. of material

No.	Item	Total minerals	Calcium	Phosphorus
		gms.	gms.	gms.
1.	Refined cane sugar	1.02	Nil	Nil
2.	Sugar cane gur	1.00	0.400	0.045
3.	Palmyra gur	3.15	0.861	0.052
4.	Date palm gur	2.60	0.383	0.062
5.	Sago palm gur	3.66	1.352	0.372
6.	Coconut gur	5.04	1.1638	0.062

Presence of Vitamins per 100 gms. of the stuff

No.	Item	Units of Vitamin B_1	Units of Vitamin B
1.	Date palm molasses*	24.3	17.3
2.	Cane molasses	10.4	2.7

The following table indicates the merits of different varieties of the sugar yielding palms. If tappers are locally

(* Semi-solid gur)

available palmyra trees can be preferred for gur making as the yield is profuse in a short period, and the quality of gur is better; there are less chances of nira being stolen as the trees are very tall and difficult to climb. Date palms though poor yielders, are much useful where even tapping is to be taught. These trees are easy to climb and manage for novices. The palmyras can be operated annually while the date palms can be used only in alternate years. Where the trees are in abundance gur may be made from coconut palm nira. If gur is made no nuts can be had from the tapped coconut trees. The season is spread all along the year and the qualtiy of gur is the best, but the tapping is more laborious than that of the palmyras. If both kinds of tappers are available it is advisable to start date palm gur in October and take up palmyras in January, so that the work can be conveniently spread over 6 to 8 months.

Yield and Season of Palms

	Palm	*Yield*	*Unit*	*Season*
1.	Palmyra	60 mds (of 82 lbs)	60 trees	Jan. to June
2.	Date	10 mds.	50 ,,	Oct. to March
3.	Coconut	45 mds.	25 ,,	Throughout the year.

8
LEATHER TANNING.

After cloth, leather is the first requirement of modern society. Even the primitive man was a hunter before he knew anything of agriculture. Hence, the industry of dressing and curing hides and skins is very old. The Rigveda refers to tanners and skins of animals prepared by them. Owing, however, to the prejudice among the religiously minded Hindus against the use of leather, it may be that this was not as highly developed an art in India as in other countries where there is no such prejudice.

The different processes involved in the disposal of dead carcasses up to the finished products, constitute a vast province of a set of small industries independent of each other. Some of them are :—

(a) Disposal of carcasses
   1. Flaying
   2. Bone meal manufacture
   3. Flesh manure
   4. Fat extraction

(b) Gut Making

(c) Horn Work

(d) Tanning and Finishing
   1. Vegetable Tannage
   2. Mineral Tannage
   3. Oil Tannage
   4. Fur-leather Tannage
   5. Finishing Currying

(e) Glue Making

(f) Leather Works

1. Drums and other musical instruments
2. Leather bottles
3. Harness
4. Bridle and other horse equipments
5. Water lifts, ropes, and other agricultural requirements.
6. Different types of footwear, purses, leather bags, belts, etc.
7. Belts, washers, laces and other machinery requirements.

Disposal of Carcasses

India holds nearly 30°/。 of the world's cattle and her estimated production of hides and skins, *viz.* 25 millions, amounts to between 25 to 33°/。 of the world production. India is, therefore, a large supplier of hides and skins. But the quality is inferior. About 70 to 80°/。 of her hides are from the dead cattle, the carcasses of which are scattered all over the countryside and are not properly looked after, whereas the carcasses in a slaughter-house are well supervised, neatly flayed and properly cured. The expert opinion is that the value of the Indian raw hide will be doubled if proper care is taken as regards flaying and curing.

The chief defects at present are the following :—

1. Improper flaying-butchers' and flayers cuts and holes.
2. Grain damages such as branding marks, dragging marks, goading marks etc.

3. Insect vermin bites.
4. Yoke marks.
5. Want of proper currying.

The low substance and flimsy texture are due to semi-starvtion that is the lot shared with men by the Indian cattle.

The following estimate gives an idea of the income that an animal may yield (at pre-war rates)

Animal	Hide	Flesh	Bone	Fat	Others	Total
Buffalo	2-0-0	0-14-0	1- 2-0	1- 0-0	0-4-0	5- 4-0
Ox	1-8-0	0-10-0	0-14-0	0-12-0	0-4-0	4- 0-0
Calf	0-8-0	0- 2-0	0- 2-0	....	....	0-12-0
Others	0-4-0	0- 1-6	0- 1-6	0- 1-0	....	0- 8-0

Bones, when slightly charred, become brittle and can be easily crushed. They lose weight when charred.

Tanning Materials

Some of the tanning materials are.

Tarwad, Babul. Ajan, Kahua, Amla, Sunari, Myrabolam (Harda). Of these Tarwad, Babul and Sunari can give better results. As there is no regular market for these barks, however, those who want to use them are required to store them in the season for the whole year. If depots of these barks be opened in every district, they can do much good to the *chamars* and they can be run successfully.

Leather goods

The village *chamars* supply agricultural leather requirements and foot wear to the villagers. The city repuirements of leather are provided out of leather imported

from Kaunpore, Bombay, Calcutta or Madras. Village tanned leather is faulty in many respects.

A good deal of waste occurs in that tanning. Sun-dried hides putrify, and faulty methods of soaking and liming spoil many hides.

Of the leather tanned very little is dressed or finished. It is necessary to encourage central currying shops at important places.

Horn Working as a Cottage Industry

Of the cottage industries which received a fillip from the present war, that of horn-working is one. Since a long time horns have been utilised in the manufacture of many useful goods; combs, card trays, handles for sticks, umbrellas, swords, daggers and knives, powder flasks, snuff boxes, penholders, buttons and toys are only a few that can be mentioned.

The manufacture of combs is by far the most important use of horn. Ladies and men alike require them. The market for combs is unlimited. The position which combs of horn had held for several centuries was usurped by imported combs of celluloid and bakelite. The industry ceased to pay and combs made of horn became rare. They became unavailable in many places. Artistic combs, for which Cuttack, Monghyr, Jessore, Calcutta, Rajkot and Baroda were once famous, were not able to hold their own against the cheap imported combs. The manufacture was, therefore, restricted to inferior varieties costing an anna or even less. The tide has now turned. Celluloid

combs of foreign make are now eliminated from the market. India is once more compelled to depend on combs of Indian make.

Why should not this industry be introduced throughout India while the opportunity is still favourable ? Horns are available every where. The fauna of India is numerous and varied. Thousands of buffaloes and cows die daily. A glance at the official figures would show that the value of horns exported annually from the various seaports of this country into foreign lands, during pre-war year, totalled Rs. 2½ lacs to Rs. 16 lacs. weighing 33,000 Cwts to 72,000 Cwts. If all these horns were to be used industrially in this country, employment could be given to 10,000 men and women.

There is practically no article now made from celluloid that cannot be made from horn. Horn articles might cost a trifle more in normal times. But they are infinitely more artistic and more durable, and therefore cheap in the long run. No one, who once gets used to horn combs, would go in for the celluloid combs.

The liminatory character of the horn, its diversely running grains, its irregular size, varying thickness and the different operations which require the use of different tools at almost every step render it very difficult to apply machinery in its conversion; the industry is, therefore, destined to be confined to hand labour for all time. It may not be out of place to mention here that even in Germany and France, the manufacture of combs from horn is a cottage

industry, though the processes employed there differ even in essential matters.

The operations do not require costly machinery. A few files, a wooden press, 3 or 4 saws of different sizes and a few pointed steels are all the implements required. They can be made almost everywhere, by village blacksmiths, and will cost about Rs. 20/- in all. From the very commencement to the finish the processes can be made in a yard in front of a cottage.

The processes too are simple and can be easily mastered in about 3 months. A whole family can find employment in this industry. Of the persons who are employed in horn working at Honavar, two personally cultivate paddy fields; 8 are coconut gardeners; 2 are priests attached to temples and the women are house holders. They work only during their spare hours. This amply proves that it can be a very valucable source of supplementary income to our village. A man of average ability, working for about 8 hours in a day, can easily earn a daily income of 8 to 12 annas. Women and boys, by working for the same number of hours, can earn 3 to 4 annas.

9

SOAP MAKING

It is common belief that soap can only be made from caustic soda, most of which is at present imported and that it cannot be made in homes or in villages out of materials locally available. We give below information regarding its manufacture in homes out of materials easily obtainable anywhere.

Materials required:

The provinces of Sind, U. P. and M. P. and portions of others are rich in a white alkaline efflorescence which appears on the ground soon after the cessation of the rains and after the winter sun has shone bright for some time. This mass is to be carefully scraped off, when a fresh supply will reappear in the space of about 12 to 15 days. The white mud (some mud also is scraped off with the white mass) is the crude soda ash of nature and contains in addition, some other solubles like common salt etc. The mud is styled variously, 'Reh' in U. P., 'Sajji-matti' commonly 'Khari-matti' in M. P., 'Posudi' in Andhra Desh, 'Ovar Mannu' in Tamil Nad and so on. The crude alkali is a free gift of nature wherever it may be found. No efforts are necessary to replant the deposits. The village dhobis know the stuff. They were using it for washing clothes till the imported soda found them civilized. Even to this day a few unsophisticated ones continue to use the alkaline mud.

Other alkaline resources, equally common place and running waste, are wood ashes, ashes in general, and ashes

of certain plants. Yet other sources are the concentrates known as Sajji-Khar and Papad Khar, the former manufactured largely in the Punjab and the latter in Sind and U. P. Papad-khar is so named because it is used in making papads (appalams).

Another material needed for soap-making is quick lime or chunam. This is so common a product that it needs but a mention. Almost in every big village one comes across a lime kiln. For soap-making purposes, the lime must preferably be as pure as possible. The cost of manufacture will thereby be minimised.

Process of Manufacture :

The Sajji-matti or wood-ash is treated with hot water until all the solubles have been extracted. The solution thus obtained is brought to a boil and stirred with quick lime or slaked lime till a clear sample taken from the vessel, when treated with say lime juice or other acid, does not give bubbles of gas. The clear liquid is the caustic soda of the villager. It may be from yellow to dark brown in colour.

Usually any oil may be taken for making soap. Cocoanut oil, Mohua oil and Punang oil are, however, the best. The oil about a seer and a half is heated, say in a kerosine tin, till water sprinkled on it makes a cracking noise. Then the caustic liquid prepared as above, is added slowly and with constant stirring. The oil will gradually change appearance, thicken and become jelly-like. The caustic must be added till a sample falls glass-like from

the edge of the stirrer. A further sample may be dropped into a tall vessel containing water. If the mass first sinks to the bottom and then creates turbidity of the water the soap has been made. If it does not sink but breaks up on the surface and causes turbidity, soap is yet to be made. Another test is to take a small quantity on the finger and taste it with the tip of the tongue. It should give a sharp, biting taste and the operation should be continued with fresh additions of caustic liquid till finally the biting just persists.

The soap is made now and being in a thick syruppy condition may be run into a conveniently shaped vessel or mould and covered up. It takes from 24 to 48 hours to set according to circumstances. It is then ready for use.

We have said that the caustic liquid may be dark brown in colour. Naturally the finished soap will retain this colour and lend a dull appearance to the soap. If a whiter product is needed, the soap is made as before but in a vessel provided with a tap at the bottom. When the tests indicate that the soap has been made, common salt is gradually added to the semi-solid mass and stirred. At some point, sooner or later, the soap mass breaks up and appears like a curd. At this point the addition of salt is discontinued and the container removed from the seegri (charcoal stove) and packed up with gunny bags in order that the warmth may not be lost. After 24 to 48 hours the tap at the bottom may be opened when dirty liquid runs out, leaving behind the white solid mass. This can be removed, kneaded with a little water and worked into balls or cakes by hand.

Equipment :—

It will have been seen that the simplest equipment, ordinarily found in every home, is all that is needed for making soap. If the materials are at hand, the cost of making soap is virtually the cost of the oils. Women in the home can make it for household use and no money need be spent on buying the ready made factory product.

10

FIBRE INDUSTRY

Cotton, wool, jute and coir are well known commercial products. A few of the lesser known Indian fibres are given below with the possibilities of their development as fibre industries :—

1. Flax and Linseed
2. Sunn Hemp
3. Ambadi
4. Bhindi
5. Sisal Hemp or Ketki
6. Plantain or Banana

Flax or Alsi

Flax, which is a kind of fibre-yielding linseed, as distinct from oilseed bearing linseed, is grown extensively in Russia and Europe, America and Japan. The fibre is manufactured into various linen goods, *e. g.* handkerchiefs, blouses, aprons, shirtings, collars, suitclothes, shoe-maker's thread, tailor's sewing thread, twines, ropes, canvas, nets etc.

In India there is a great prospect for this industry, if flax could be grown on proper lines and if technical knowledge of retting and scutching of the fibre to suit the requirements of the manufacture is gained. Flax for fibre, has been found to yield a good crop when it is grown as a Rabi crop. The seeds are sown thickly to yield long stems suitable for fibre extraction. Flax stems grown on cultivator's tracts show a percentage of long fibre content of about 7½ to 8 and of low or short fibre of 1½ to 2½.

Common Linseed as a fibre crop

It has been found that when linseed is sown thickly to obviate branching and to yield a long stem, it yields a fibre, which, although unsuitable for the production of finer linen manufacture, can be made into canvas, twines, cordage, etc. Both the fibre and the seed can be obtained by this method. Though yield of the seed is minimised to some extent, the profit arising from both, the seed and the fibre, is remunerative enough.

Sunn Hemp

Sunn hemp is a well known commercial commodity. A large export trade in this fibre exists in the U. P., M. P., Bombay, Madras and to some extent in Bengal. The best specimen of Sunn hemp comes from Ratnagiri district of Bombay.

Sunn hemp cultivation is really a better proposition than jute in tracts where it can be introduced. It possesses certain advantages over the production of other fibre crops *viz.* (1) It takes 3 to 4 months to mature; (2) yield is

better; (3) does not require the same amount of cultivation, care and attention as jute; (4) its cultivation enhances the fertility of the soil, as it collects atmospheric nitrogen through the agency of bacteria which attach themselves to its roots; (5) it kills weed on land which is infested with weed; (6) it does well with moderate rainfall.

Sunn hemp fibre is made into sutli, twines, fishing nets, chords, ropes, coarse canvas, sacking etc. in most of the provinces by the cottage workers.

It may be added that Sunn fibre is many times stronger than jute and can stand any amount of moisture without losing its strength unlike jute.

Ambadi

Ambadi is grown extensively in Bombay and Madras. Elsewhere it is grown as a mixed crop to a small extent. The fibre finds an outlet from both these presidencies and is known in commerce as 'Bimli jute.' The fibre is strong, soft and is a very good substitute of jute. Its cultivation in these areas where jute cannot be grown offers certain scope. It requires very little care in growing and separation of the fibre.

Bhindi

It yields the vegetable known as 'ladies fingers.' When properly separated, the fibre is soft, strong, lustrous, silky and suitable for finer textiles. But if no care is bestowed the fibre at best serves the same purpose as other jute substitutes. It must, however, be rememberd, that the seeds are to be thickly sown so as to get longer

fibre. The separation of the fibre is very simple, mere water retting and slight manipulation being sufficient to loosen the fibre. It has undoubted possibilities.

Sisal Hemp–Ketki.

New uses of Sisal hemp in marine cordage, artificial silk, substitute of camel hair for oil-mill press cloth, and fibre belting, rugs and carpets of various designs, fancy ladie's hats, purses etc. ropes, cordage, the all important 'Binder's twine', mattings, fishing nets, etc, have been discovered. The short 'tow' fibre has been found useful for brooms, mops, brush-wares, high class papers, etc. The green pulp obtained as a waste in the decortication of the fibre from the green leaves, has been found to yield a valuable 'Fertiliser' rich in nitrogen, superior to cattle manure. All these factors have led to a revival of interest in Sisal in present years.

India holds out immense possiblities of the industry. Not only can India be made independent of foreign sources of supply of Sisal but an export trade could also be opened at the same time enriching the Indian soil by its pulp.

Plantain or Banana Fibre

There is no doubt that the fibre is worth exploitation in as much as plants after yielding the fruits are cut off and thrown away. The fibre can be utilised for ropes, paper making etc. and the pulp made into manure. The fibre is obtained by scrapping the sheathes by passing them repeatedly through a knife fixed to a wooden board.

11

PAPER-MAKING

The manufacture of paper consists of a series of operations each of which plays an important part in the production of the desired properties in any particular kind of paper. The general principles underlying these operations are the same irrespective of the original material or of the nature and quality of the finished paper.

The essentials of paper-making consist of two processes :–

1. The disruptive or splitting process which consists in separating cellulose in a greater or less degree of purity.
2. The formative or cohesive process in which the small fibres are brought together to form a web or sheet.

These are considered separately in detail below :—

The paper-making material, technically known as cellulose, forms the basis of the solid framework or plants together with gummy and resinous substances. The splitting operation consists in freeing the material from the extraneous substances by the use of chemicals which can dissolve out the incrustants. Since the inertness of cellulose is only relative to the concentration of these chemicals, it is of importance that great care be taken in the different processes through which the raw material must pass to ensure that none of the chemicals employed affect it adversely.

Any fibrous material can serve as a raw material for paper-making. The following considerations, however, limit the choice from amongst the many :—

a. The difficulty of reducing the material to pulp.

b. Quality and quantity of the fibre or cellulose that can be obtained from the raw material after subjecting it to the prescribed chemical treatment.

c. Resistance of the material to chemical or other treatments.

d. The relative quantities of the incrusting non-cellulose matter.

e. Availability and abundance of the raw material.

f. The cost of the process.

While the above considerations determine the choice of the raw materials, they do not necessarily restrict the paper-maker to the raw products of the vegetable kingdom. Textile goods such as rags or other forms of fibrous material going to waste, e. g., ropes, may also be employed.

The waste materials from which paper has been successfully prepared at the head quarters of the All India Village Industries Association, Wardha, comprise of rags, gunny bags, sannhemp (in its raw state and the old articles made therefrom), the various grasses, straws of wheat, rice, etc., linseed stalk plalntain tree bark, palas bark, bagasse, cotton stalk, bhendi (Hibiscus esculentus) stalk, leaves of the cocoanut and datepalms, etc.

To convert the raw material into pulp, it is first sorted out and freed from dust. It is then cut into pieces of uniform length, washed and retted or boiled with water to remove starches and other soluble matter and to make the material soft. After washing, the material is treated with alkalis, in hot or cold, to remove the residual non-cellulose matter,

and then passed on to the dhenki (or stamping lever) where it is beaten till the individual fibres separate out. During the alkali treatment, care should be taken to see that the container is closed, as otherwise the cellulose may get oxidised and lose some of its desirable qualities. The pulpy mass from the dhenki is thoroughly washed and bleached, usually with bleaching powder, to make it white. Sometimes it may not be possible to bleach the pulp completely. In such cases, a large quantity of bleaching powder should not be used, as it tends to impair the strength of the fibres. After bleaching, the pulp is washed free from chlorine. The residual chlorine in the pulp is harmful and therefore it is better to use a 0.1 per cent. Solution of "hypo" or sodium sulphite to eliminate the last traces of the bleach. Towards the end it is advantageous to give a "soaping" to the pulp. The fibres are thereby rendered softer and possess greater felting power. As the quality, the feel, the look and the strength of paper depends upon the successful carrying out of the different processes through which the material must pass before it is converted into pulp, it is well to emphasise that the greatest care must be taken in the discharge of the above operations, if the best results are to be obtained.

After the splitting process is over and the pulp has been obtained pure, there remains the actual paper-making, which consists in mechanically fibricating or felting together the ultimate or small units of the vegetable fibres, which have been reduced to a suitable condition and

suspended in water, into a continuous web or sheet which is described here briefly. The operation is a skilled one. The concentration of the fibres in the pulp is maintained at a half to one per cent. So that the mixture is sufficiently fluid. The pulp is then, well stirred to break the lumps in order to separate the individual fibres and to distribute them uniformly in the water. The sheet is fabricated on a mat, made of knot-less grass woven with horse hair. While dipping the frame vertically into the vat, and turning it horizontaly in the hands to bring it to the surface, the worker has to give simultaneously a to-and-fro and vibrating or shaking motion. At the same time, his thumb must be gently tapping the two detachable marginal strips of wood which keep the mat taut. The vibration helps the felting of the fibres in the sheet formation.

After the sheets are removed with or without the use of a napkin, the excess water is pressed out and they are dried on walls or as is convenient, and then sized. There are three ways in sizing the paper :

a. Glue sizing,
b. Starch sizing and
c. Rosin sizing.

The last of these is introduced in the vat before the paper is made, whereas the others are applied separately after the sheets are dry. The object of sizing is mainly to minimise the absorbent quality of the paper in order to prevent the spreading of ink when the paper is used for writing and to make the paper strong. Some germicides

are added to keep off gungi, moulds, etc. The sized paper is polished with a conch or a hard smooth stone suitably embedded in a wooden handle. Lastly, the paper is cut to the required size and is ready for use.

Amongst the various paper-making materials available in the Central Provinces forests, the salai wood is very suitable for the making of straw-boards. The process of manufacture is essentially simple. The wood is first chipped into small pieces which are then treated with freshly slaked lime, the resultant fibrous mass is beaten in a rotary beater or by hand to reduce it to a pulp, and finally the required board is moulded from the pulp and pressed either in a hand or hydraulic press, as the case may be. The estimated cost for a large scale plant to produce ten tons a day is given as three lakhs of rupees. The large amount of grass that is also obtainable in the forest is useful as an admixture with 'salai' wood for the manufacture of straw boards. Sabai grass (Pollinidium binatum) with long blades of remarkable smooth silky texture, grows wild over miles and miles of the area stretching from Nowegaon across Hirdagarh, Jaini and Parasia right up to Tamia. The present use of this grass is to make ordinary rope for local village needs. This large source may be suitable for the manufacture of paper.

Paper-making, as has been said so often, is both an art and an industry. A glance at the technique will show that the various items are of such a nature that they give work not only to men but also to women and

children. There is scope for both skilled and unskilled labour as well as for heavy and light work. The dusting, sorting and cutting can be done by women. The operations of washing, beating, drawing-water, etc., need men to do them. Lifting is work for a skilled person either a man or a woman. Sizing is again a suitable work for a woman. Matmaking, though light work, is an important item which needs a woman with an artistic taste to do it. The operations of glazing and cutting form men's work while those of drying and removing the dried paper may be entrusted to children. Envelope-making, etc., is left to women and children and so on. In short, the industry can draw forth the best in every individual skilled or unskilled, old or young, strong or weak, man or woman and provide gainful employment to many an indigent family. The annual earnings of the skilled workman amount to about Rs. 180 and those of the unskilled to Rs. 100.

For one working unit five persons ars required, out of whom two will be skilled and the rest unskilled. The capital required for the unit is about Rs. 100/-. The equipment is not at all complicated and can easily be made locally. The margin of profit is ten percent. Nearly two-thirds of the working expenses are labour charges.

12

ERI SILK WORM REARING

Eri silk is the cocoon of an insect which feeds on castor leaves. Assam is the home of eri silk worms. They are bred entirely in-doors. The industry can be carried on in many parts of India. It is pre-eminently suited as a cottage industry, as the work involved is simple and inexpensive and can be easily carried on in 'tatti' house by women and children in their spare times. The worms are hardy and thrive best in a warm and moist climate from July to December and in February and March. The ideal time for their rearing is during the rains, when the temperature and humidity vary from 75 to 85° F and 85 to 95 per cent respectively. The margin of profit in the industry is, however, small and the utmost economy has to be practised while rearing the worms. The rearing should be done on a small scale in one of the dwelling rooms; it will not pay if done on a large scale with hired labour. It should be undertaken as an adjunct to agriculture, like the keeping of goats and cows or the sowing of vegetables for home consumption. Castor should be cultivated in the homesteadland, if possible, and no expenditure should be incurred on that account. It is not difficult to grow castor and one can use the leaves for rearing which would otherwise fall down and be wasted. The cultivator can expect to derive an extra income for his family by rearing the worms and by selling the cocoons and castor seeds. If one starts rearing in July with one thousand worms, one can get about 100,000 eggs

in August and if one can rear half of them successfully a good income is ensured.

Eri silk is very strong and durable. It is valued on account of its softness and cream colour which improves after use. There is no life killing in any of the processes and hence Jains ond Buddhists prefer it to any other silk. The cocoons are spun into thread on the charkha or takli like cotton and not reeled like mulberry or tasar cocoons, as long continuous thread cannot be taken out of them.

INSTRUCTIONS FOR REARING.

Appliances.

Bamboo frame works, bamboo trays, baskets and dry mango leaves or thick leaves of other plants are the only requisites for rearing the worms. About 400 mature worms can be reared in about six square feet of space.

Food Plants

Castor (endi or eri) is the best plant for eri worms. They can be fed on Kesuru (marck). The are sometimes fed with the leaves of other plants also in the later stages of their growth, when the supply of the eri leaves runs short, such as cassave, papaya, sweet potato, sisu, cabbage, tapioca, methi, agasthiya, flame of the forest etc. The quality of the leaves should be such that they contain more of nourishing sap together with a good percentage of cellulose matter. The younger worms should not be fed with any other leaf except eri (tender ones).

Castor

Castor is sown in June or July after the first fall of rain in October. About 10 seers of seed are sown in an

acre of land. Rearing can be commenced after about three months of the sowing. An acre of land under castor seed yields about 75 maunds of leaves and about 10 maunds of seeds per year. About one maund of dry pierced cocoons can be obtained from the above leaves.

How to rear ?

Eggs are kept in a perforated box or in a piece of cloth or paper. They change into light blue colour before hatching. Tender and soft leaves are put over the newly hatched worms which crawl up to feed upon them. After about ten minutes the leaves are turned upside down so that sufficient number of worms can crawl on them. Then the leaves are transferred to a tray with the worms. The following points should be noted :—

1. Worms change colour with their growth.
2. They moult or cast off their skin four times in the caterpillar stage, i. e., on the third, fifth, eighth and twelfth day.
3. They change into chrysalides within the cocoons and then they come out of the cocoons as moths.
4. Before moulting, these worms decrease in size, remain motionless and stop feeding. They look sick at the time and should not be thrown away.
5. Serve leaves when all the worms go to the moult.
6. Keep worms of the same day of hatching in one tray.
7. When all the worms come out of the moult, serve entire leaves; and when they crawl upon

the leaves, transfer the worms with the leaves to the second tray.

8. Transfer to another tray those worms which have not crawled on the fresh leaves with the broken peices of dry leaves on which they crawl.
9. Throw away the faeces and dry leaves.
10. Clean the trays once a day.
11. Burn or bury weak and diseased worms whenever they are seen.
12. In hot and dry weather sprinkle the floor with water three or four times a day.
13. The leaves need not be chopped but while serving they may be torn into two or three pieces in the earlier stages.
14. Young worms require tender leaves but harder leaves should be served as they grow older.
15. Do not serve very hard and old leaves as they bring in diseases.
16. Fresh leaves can always be given safely to worms.
17. In hot dry weather, feed oftener if the leaves dry up. In winter and on rainy days, the number of feedings should be less.
18. Do not serve dewy, dusty, muddy, fermented and wet leaves.
19. Feed the worms often and little.
20. Avoid overcrowding.
21. Do not handle the worms too much.

22. Do not feed the moulting worms.
23. Rear little but rear well.
24. The quantity of leaves to be served each time should be determined by the appetite of the worms.
25. Do not disturb the moulting worms.
26. In case some worms do not moult uniformly they must be transferred with the leaves served to them.
27. The worms will not die if they remain without food even for about twenty hours after casting off their skin.
28. The newly hatched worm is about one sixth of an inch in size.
29. After the first, second, third and fourth moultings they grow to 3/8 ths, 3/4 ths, 1 and 1½ inches respectively.
30. On attaining its full size the worm grows to about 3½ inches in length.
31. About 300 mature worms will require a space of about six square feet.

The full grown worms pass a semi liquid excrement, stop feeding, lose in weight and size and begin to wander about the tray from 9 to 12 in the morning. Worms which remain without food for a long time also wander about. The mature or ripe worms should then be picked out and placed in the spinning baskets. One layer of dry leaves straw, grass, wood shavings or crumpled paper, etc. is put in the basket and over it about 100 worms are placed and again another layer of spinning medium is put over the worms. About 500 worms can be kept in this way in one basket of diameter and depth of 1½ feet and 1 foot

respectively. To prevent the worms from crawling up, the basket is covered with a lid, or it is turned upside down. They are then kept in an airy room. The worms begin to spin at night. After five days in summer and eight days in winter the cocoons are picked out from the spinning basket and they are spread in one layer over a tray for the emergence of the moths.

Enemies of Eri worms

Ants, rats, lizards, squirrels, silk-worm flies, spiders and birds, mangoose and camaleon, etc are the enemies of eri worms.

13

COW KEEPING

1. The Dual purpose Cow

It is often contended that you can either have high milking cows or excellent draught producing cows. This may be all right from the point of view of show-qualities or breed. But if the breeding policy be adopted from the point of view of welfare of the cultivator, then, if by a little sacrifice of the speed quality of the draught cattle the cultivator gains, then that thing should be done. And experience has shown that laying stress on the milk capacity of the cows of all breeds does not ordinarily affect the draught qualities. On the contrary, draught qualities increase by more milk coming to the calf out of the increased yield.

2. Selective Breeding

Judicious selection has been of the best aid to the breeders in the improvment of live stock. By selection, the

best ones are retained for propagation and the undesirable ones are rejected both in the male and the female. The general increase in milk production in any specialised dairy breed can be attributed to the practice of selection. Environment, feeding, and handling also, of course count. For permanent progress there must be consistent selection and mating of those which have demonstrated that they carry the desired combination of germinal factors.

In-breeding is the mating of closely related individuals such as brother to sister, sire to daughter or son to dame. In such cases, the primary effect is to intensify or fix hereditary qualities and thereby bring about certain prepotency for certain characters. In the early establishment of any breed for the fixation of a type, in-breeding is very valuable. The transmission of the character of the parent to the off-spring then becomes almost certain. And it is by this means that the best breeds of cattle in Europe have been developed. But it has its dangers too. The same mechanism that fixes good points will fix the bad points also, and may lead to disaster. Then, again, close in-breeding decreases fertility, vigour and longevity. In-breeding accompanied by selection is used to great advantage but in-breeding, in the hands of any but an expert breeder, is dangerous.

Line Breeding:

The mating of animals related to a lesser degree than described in in-breeding is called line breeding. This has most of the advantages of in-breeding with much less

of the concurrent dangers of in-breeding. This is adopted by most renowned breeders.

What Selective Breeding can do

The Royal Commission on Agriculture records the following observation placed before them in 1927.

"In many draught breeds, there are not a few individual cows which have the full characteristics of the breed and are at the same time fair milkers. That this is true in the case of one breed at least is proved by the experience on the Chharodi farm with Kankraj cattle which are essentially fine draught animals. Five years selection has resulted in raising the annual average yield from 438 lbs. per cow in a herd of 100 animals to 1,330 lbs. per cow in a herd of 93; both figures of yield are in addition to the supply for the calf which is estimated at about 450 lbs." This was the position in 1927. At the enquiry of 1937 it was found that the Kankraj breed gave 920 lbs of milk per lactation in the hands of the villagers in their native tracts, while under care and management in the Government farm at Chharodi the milk yield varied from 2000 lbs. to 4000 lbs. and in rare cases to 5 or even 10 thousand lbs.

3. Cow vs. Buffalo

The following table gives the present day position of the cow *vs.* the buffalo in the different provinces.

No.	Province	No. of cows in millions	No. of buffaloes in millions	Ratio of the buffaloes to 100 cows	Proportion of milk contributed by buffalo.
1.	Punjab	2.6	3.0	115	63.6
2.	U. P.	6.0	4.2	70	46.9
3.	Bombay	2.0	1.2	60	51.9
4.	Madras	5.9	2.8	47	50.1

5. Sind	0.8	0.3	37	40.0
6. Bihar & Orissa	5.7	1.6	28	53.9
7. C. P.	3.1	0.8	26	26.8
8. Assam	1.7	0.19	11.1	18.4
9. Bengal	8.2	0.27	0.33	7.6

Numerically cows exceed she-buffaloes in every province but the Punjab. However, in five out of the ten provinces buffalo actually produces more than half the total milk production. It is significant that the main ghee producing areas in India are situated in these provinces. In British India she-buffalo provides 47.5 per cent of the total milk supply; in India as a whole they provide nearly 45 per cent.

Sir Aurther Oliver clears the position of the buffalo thus, "Where abundance of coarse fodder is available and where the production of ghee is a major consideration, or where liquid milk is produced for sale usually by unscrupulous and uncontrolled hawkers, the she-buffalo is at present commonly preferred. But investigation has shown that pure bred cows of certain Indian breeds of cattle can, in a comparatively few years, be improved by proper feeding and management to a point where they can compete successfully with the buffalo in economy of milk or butter fat production. In view, therefore, of the greater general utility of cows as compared with the buffaloes in that they produce better working animals as well as milk and of the important fact that cows' milk is a much better food, particularly for children, than buffaloes' milk watered down to the same level of butter-fat. The question whether cows should not be bred and as well fed and maintained as are she-buffaloes, is one which merits careful study".

Though the buffalo yields more ghee its quality is inferior as compared to cow's ghee. Cow's ghee contains ten times the carotene (precursor of vitamin A) of buffalo's ghee. While the carotene content of buffalo butter fat is, between 20 and 30 micograms in 100 grams, that of cow butter fat is between 200 and 570 micograms.

Cow-ghee is superior to buffalo-ghee in regard to the stability of its Vitamin A towards heat. The little Vitamin that the buffalo butter has, suffers worse under heat.

Cost of Milk and Butter-fat from Cow & Buffalo

About cheapness or otherwise the following figures are published in the Milk Marketing Report of 1943.

Cost of milk production of some Government Farms

	Sindhi cows	Ordinary Sahiwal Cows	Ferozepur Sahiwal Cows	Half bred Cows	Murral Buffalo
(a) Cost per pound of milk in pies					
Food cost during lactation	4.48	4.45	3.88	3.55	5.68
—do—dry period	1.42	1.61	1.01	0.69	5.95
Depreciation of stock	2.01	1.83	1.33	1.42	2.20
Labour cost (exclusive of supervision	1.51	1.29	0.94	0.83	1.29
Total	9.42	9.18	7.16	6.49	11.12
(b) Cost per pound of butter fat	15-8.4	15-3.6	12-11.6	13-6.3	13-3.1
No.of animals studied	84	175	51	213	294
Average lactation yield (lb)	3,050	3,800	6,000	6,000	3,100

The economic efficiency of the Ferozepur Sahiwal for the production of milk and butter fat is evident from the above table. These figures related to 1932 when the investigation was carried out. By this time the Ferozepur herd was specially built up and had over 20 years systematic selection and breeding. Milk yields of Sahiwals and other cows have appreciably gone up since.

Buffalo less responsive to improvement

"The small amount of experience gained by agricultural departments seems to suggest that the buffalo is less responsive to selective methods than the cow" observed the Royal Commission.

The following table gives the yield of cows and buffaloes in Government & Military Farms :

Animal giving	No. of Cows		No. of Buffaloes	
	1912-13	1924-25	1912-13	1924-25
10,000 lbs. milk & over	–	1	–	–
8,000 to 10,000 lbs.	–	34	1	–
6,000 to 8,000 lbs.	9	116	12	25
4,000 to 6,000 lbs.	84	438	117	354
2,000 to 4,000 lbs.	834	685	778	605
Under 2000 lbs.	1,257	233	859	124

The number of cow yielding over 2000 lbs. has risen during the short period of 12 years from 1.3 to 20.5 per cent and the number of buffaloes from 1.6 to 10.8 per cent.

COMPARATIVE STATEMENT OF THE CATTLE OF THE SEVEN BREEDING TRACTS IN INDIA

	Average of the seven tracts	Montgomery	Hariana	Kosi	Bihar	C.P.	Kankraj	Ongole
Average milk yield day in lbs.	3.74	4.72	4.46	3.89	2.74	1.67	3.90	4.64
Average lactation length in months....	8.81	10.43	7.62	8.25	8.14	8.94	7.90	9.54
Average dry period in months	9.21	7.24	7.62	8.31	8.48	11.80	10.21	9.47
Average calving interval months	18.20	17.68	15.24	16.61	17.03	20.74	18.24	19.03
Estimated average lactation yield in lbs....	943.0	1343.8	986.0	865.0	651.3	411.3	919.8	1236.4

The Missionary Journal "Dnyanodaya" says :—

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